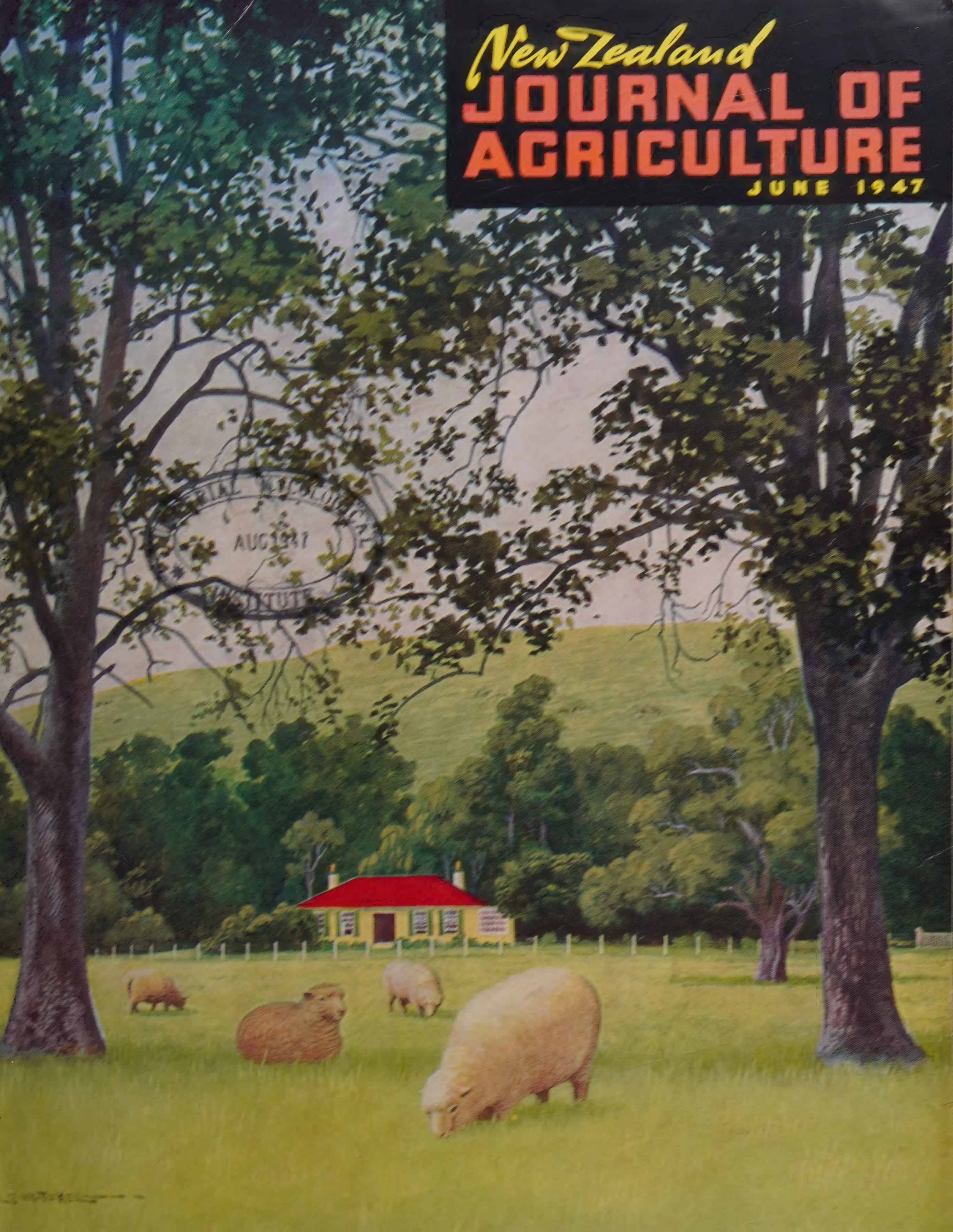
New Zealand
JOURNAL OF AGRICULTURE

JUNE 1947



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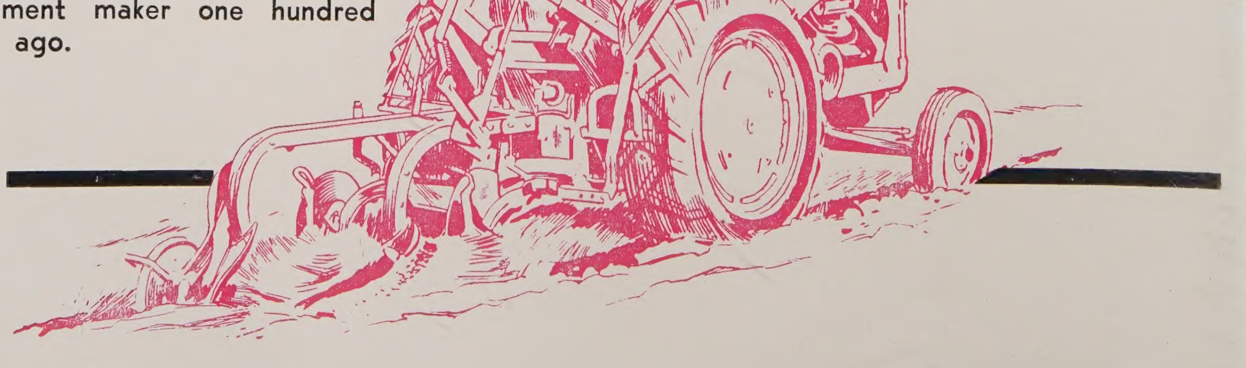

This month's cover

The gracious setting for the modern farmhouse near Christchurch shown on this month's cover is typical of the possibilities available to many farmers in New Zealand. The trees around the homestead illustrate a combination of utility planting for shelter, shade, and timber, together with the development of a beautiful and dignified framing for the farm home.

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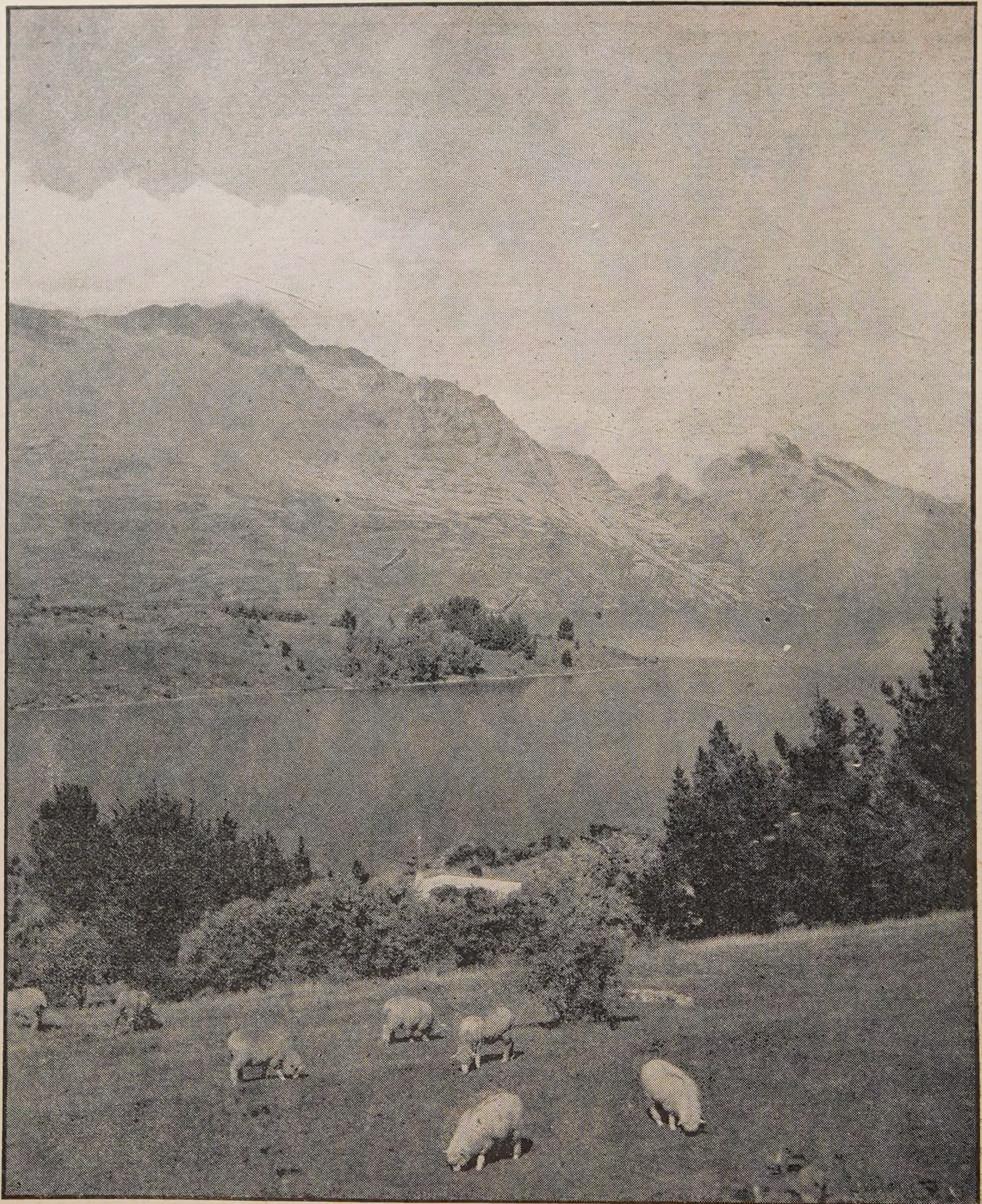


Frankton Arm, Lake Wakatipu, Otago, with Cecil Peak (6417ft.) and Walter Peak (5956ft.) in the background. The only outlet of the lake is along Frankton Arm, at the head of which are the beginnings of the Kawarau River. Cecil and Walter Peaks, which are on the west side of the lake, form part of the magnificent mountain scenery surrounding Queenstown and giving Lake Wakatipu its grand setting.

EFFECT OF JUTE SHORTAGE ON N.Z. INDUSTRY

Serious Lack of Produce Containers Possible

NEW ZEALAND, in common with the rest of the world, is dependent on India for supplies of jute for the manufacture of containers for products and for other industrial uses. As a result largely of the world shortage of food, India's jute acreage has been materially reduced to enable increased food crops such as rice and millet to be grown, with the result that she is not in a position to meet the demands made upon her for jute requirements. This has led to all countries being put on a restricted export quota by the Indian Government, and New Zealand, along with others, has been materially affected, and is receiving only slightly more than half the full requirements.

Jute is a vital commodity to our primary industry, and is very important in many of our secondary industries, being used principally for the manufacture of wool packs, corn sacks, fertiliser bags, sugar and other containers, cement sacks, meat wraps, animal and rick canvases, upholstery, carpet backings, and a hundred and one other purposes. Unfortunately, the prospects of an immediate improvement in supply are not good, and no improvement can take place until the jute crop acreage is increased and a favourable growing season is experienced.

Realising the seriousness of the position, the Government recently sent representatives to India to negotiate for increased supplies, and at the same time made representations to the United Kingdom with a view to ascertaining if our quota could be further augmented. Slight increases were obtained, but despite these we are still in the unfortunate position of being very materially short of our full requirements, and the utmost care will have to be exercised if we are to cope with the next production season without serious disruption in our primary industries.

In an endeavour to find a solution to some of the difficulties locally, a Jute Emergency Committee, with wide powers in the control of jute, has been set up by the Government, its main objectives being:—

1. To supervise the importation of essential jute goods to the extent of the quota available and to distribute them in the best interests of the Dominion.
2. To endeavour to obtain satisfactory substitute containers where necessary.
3. To encourage and organise the widest possible use of used containers within New Zealand.

The decision of the committee that imported wool packs and corn sacks shall in future be of lighter weight will mean a saving of hundreds of tons of jute and make our quota go further. The importation of certain types of sacks for which it is considered substitute or second-hand containers can be used in an emergency is temporarily suspended.

The Government will do everything possible to try to obviate hardships and inconvenience in the allocation and direction of new goods to vital sections of primary and secondary industries. Substitute containers will be confined principally to paper and cotton, supplies of which are almost as difficult to obtain as jute. Fortunately, however, the Government has been able to buy overseas a large quantity of multi-walled paper bags which will be used for the distribution of a large proportion of fertiliser and cement, a practice which is normal in many other countries.

In the collection, conservation, and use of second-hand bags within New Zealand, farmers, merchants, users of produce or products received in sacks, and even householders can materially assist to relieve the acute sack shortage. Today an idle sack is a lost sack, and all sacks should be put back into circulation as soon as possible to avoid any hold-up in the distribution of foodstuffs and other produce. If the thousands of sound sacks lying unused in sheds, stores, and homes were collected and made available to merchants and farmers, there would be a smaller demand on new containers and a larger proportion of the Dominion's quota of jute from India would be available for other important purposes.

As Minister of Agriculture I appeal for public support to be given freely to representative committees which are being set up throughout the country to organise the recovery of used sacks. No person should retain more sacks than are required for immediate use. Hoarding is likely to aggravate the position and could lead to a hold-up in the distribution of primary products which would have very serious effects on the whole community.

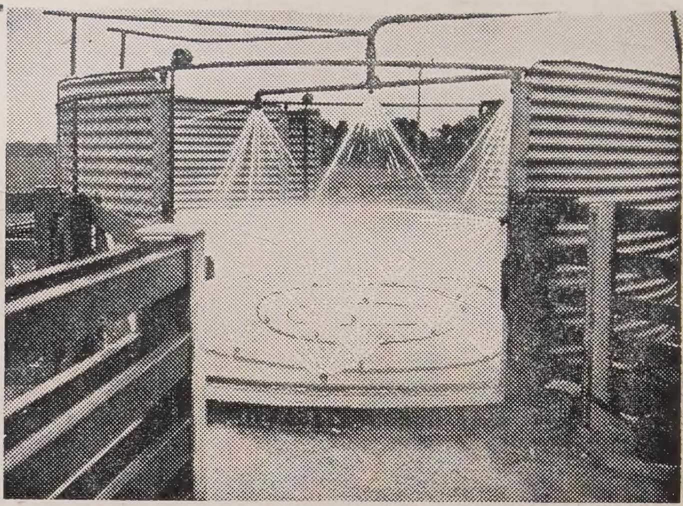
To encourage additional labour to the wool pack mills at Foxton, where production could be greatly increased if more female staff and accommodation were available, the Government has given urgent priority to the erection of 50 State houses, which are already under construction there, and transit housing is also being arranged for male and female single workers.

It must be obvious, particularly to the farmer, that if sincere efforts are not made to remedy this serious shortage of sacks and other containers, the effects could easily be disastrous.

The Government is doing everything it reasonably can to obtain the utmost quantity of jute from the reduced supplies available from India. I am confident that the steps which have already been taken will materially assist the position, and if the farming community as a whole also assist by seeing that sacks are put to the fullest use, we will get through the difficult period with the minimum of disruption.

EDWARD CULLEN, Minister of Agriculture.

Here are two Investments . .



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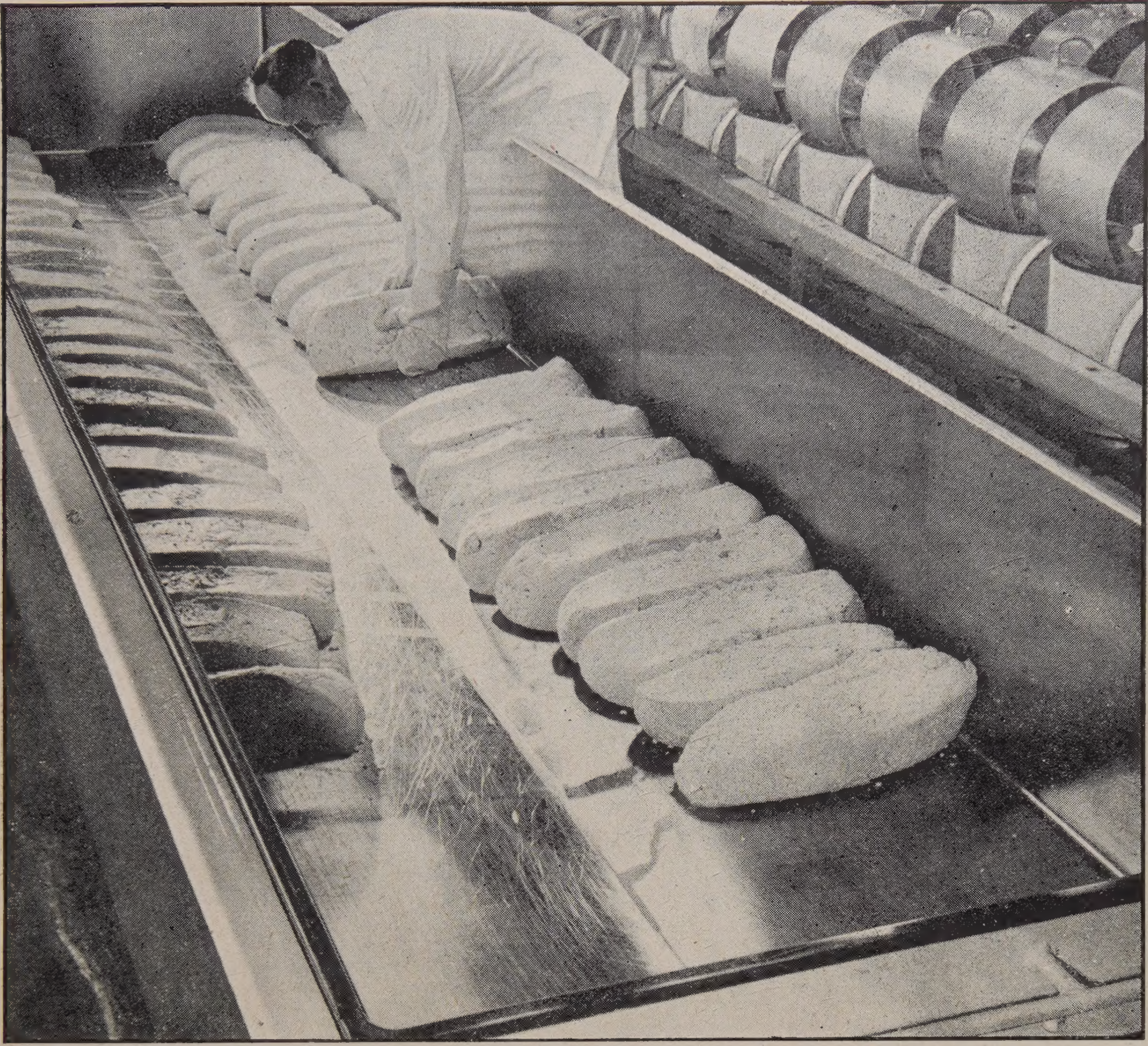


CHEESEMAKING IN NEW ZEALAND

By J. J. WALKER, *Dairy Instructor, New Plymouth.*

CHEESEMAKING is said to have been discovered by an Arab traveller who, resting for his midday meal, found that his milk ration, carried in a receptacle made from a goat's stomach, consisted of a watery liquid and a solid portion. He partook of both and found them acceptable and nourishing. From these beginnings the combination of rennet and milk for cheesemaking was developed through the centuries.

THE process of cheesemaking was introduced to New Zealand by the early settlers, the cheese being made on the farms; women did most of the work, and in some parts of the country this method was followed until recent years.

While records show that the factory system started with the building of a factory at Highcliff, Otago, in 1871, it was not until 1882 that a second factory was erected at Edendale and two others followed in the same year, one at Flemington near Ashburton and the other at Te Awamutu; therefore 1882 is generally recognised as the date the factory system was started.

From small beginnings the cheese industry has made steady progress until during the season 1941-42, as a result of a request from Great Britain for more cheese, 153,000 tons were exported. However, the normal quantity exported is about 95,000 tons annually.

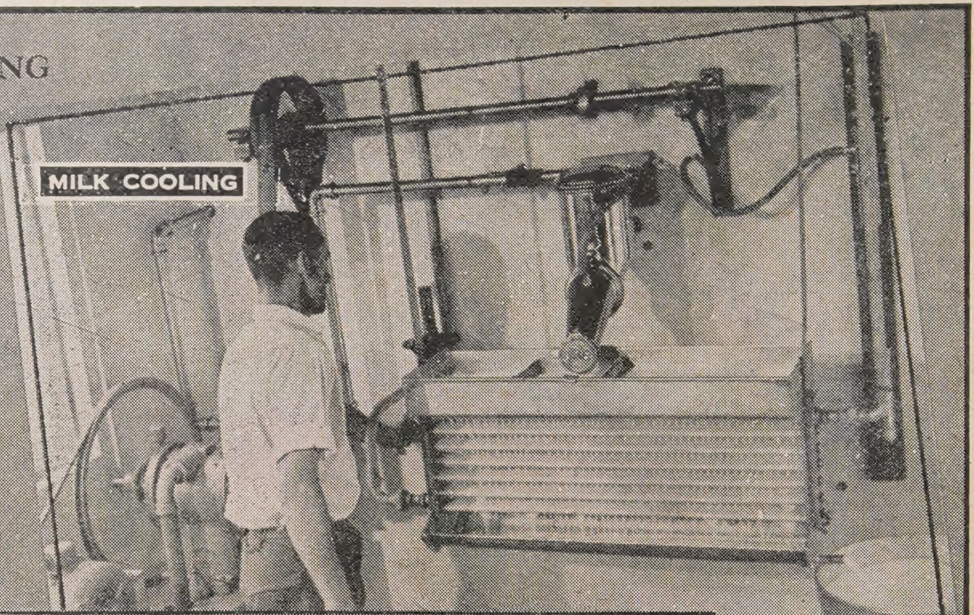
Co-operative Movement

Coinciding with the introduction of the factory system came the co-operative movement, which has made remarkable progress, until today only two cheese factories are proprietary, all others being co-operative organisations, of which the industry is justly proud.

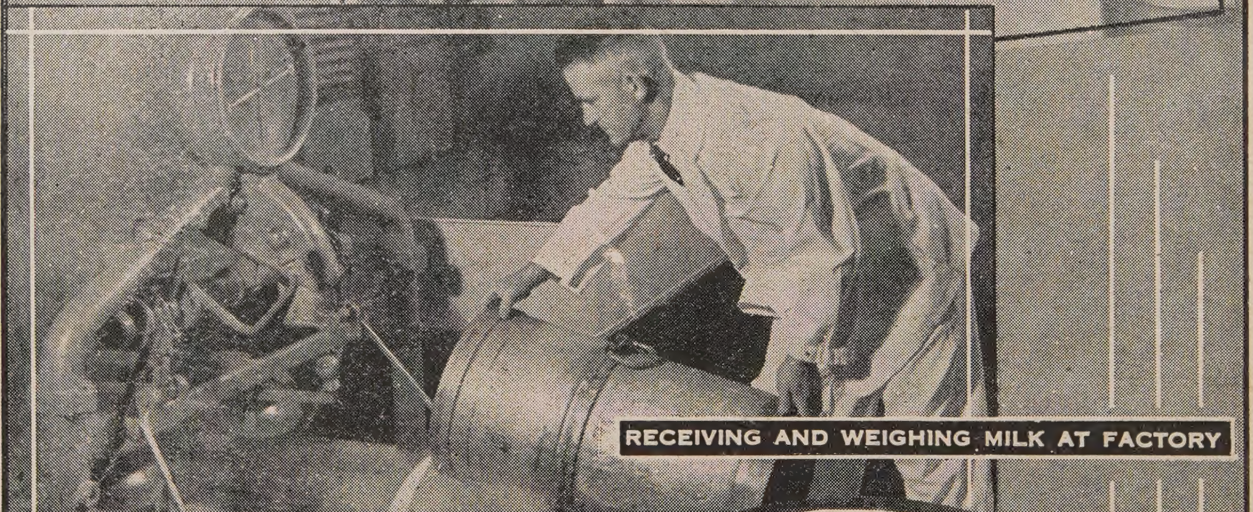
Among the many varieties of cheese made throughout the world, the cheddar type, named after the Cheddar

Illustration above: "Cheddaring" cheese to encourage further drying of the blocks of curd.

CHEESEMAKING IN NEW ZEALAND

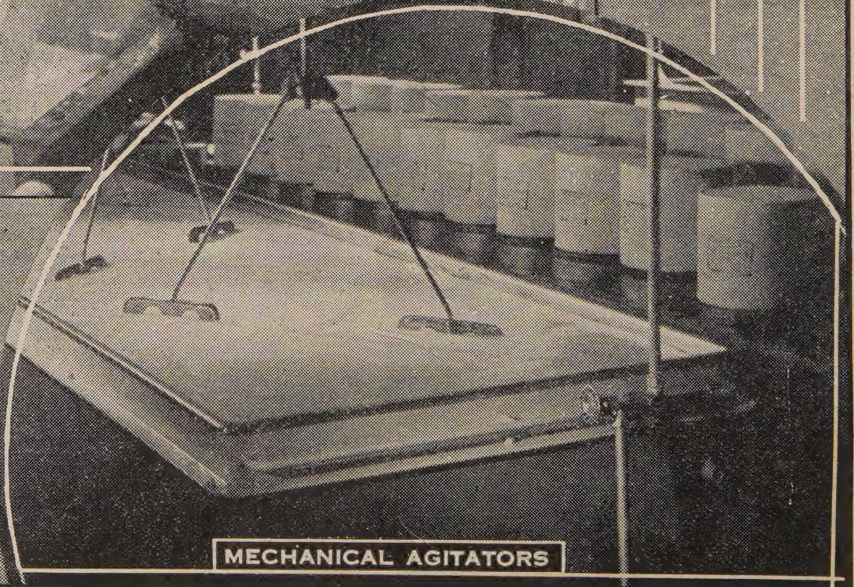


MILK COOLING



RECEIVING AND WEIGHING MILK AT FACTORY

The total output of the 270 co-operatively owned and operated cheese factories in New Zealand was 103,243 tons in 1944-45, of which 95,548 tons were graded for export. On arrival at the factory milk is weighed, tested for butterfat, and graded. Every cheese factory in New Zealand is equipped with mechanical curd agitators for stirring the milk, which is placed in stainless steel vats.



MECHANICAL AGITATORS

Valley in Somerset, England, was selected for development in New Zealand. The process of manufacture combines the English, Scottish, and Canadian systems. Today there are 261 factories, well organised and equipped with modern machinery and appliances, engaged in the manufacture of high-quality cheddar cheese.

The factory system naturally tended to improve manufacturing conditions, and while much of the cheese was of a satisfactory quality, it did not have the degree of uniformity it has today. Factories being widely separated, managers were working on different lines of manufacture, and to gain uniformity, raise the quality, and encourage the industry the Dairy Division's instruction service was started in 1889 and in 1894 grading of dairy produce was begun.

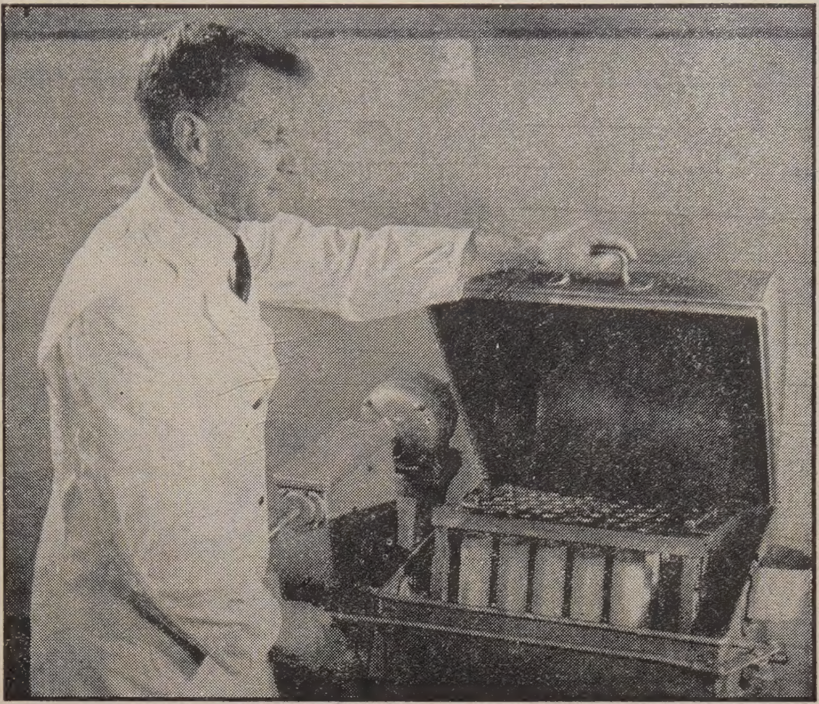
These two services placed the industry on a uniform basis and expert advice was made available to dairy companies on the layout, erection, and equipping of factories and also on manufacturing.

The first essential for good-quality cheese is a sound, clean milk supply. Cleanliness throughout manufacture is of major importance, and, combined with the cheesemaker's skill and knowledge, is the basis of high-quality production.

Manufacture starts with the arrival of milk at a factory, farmers mostly delivering their own supply, although milk collection services operate in some districts. All milk must be delivered at a factory by 9 a.m. On being received the milk is weighed and samples taken for butterfat and grading for quality. Tests for butterfat are carried out every 10 days or three times a month, when the supplier is credited with the butterfat supplied for the period.

Inoculation of mother culture starter.

CHEESEMAKING IN NEW ZEALAND



Grading milk at the factory by the New Zealand curd test.

Babcock Method

The test of the milk is determined by the method evolved by Dr. Babcock in 1890 after experiments to devise a quick and accurate way to ascertain the percentage of fat in milk. Dr. Babcock's contribution must be accepted as one of the greatest factors in the development of the dairy industry. Coming at a most opportune time, it gave the industry a better and safer means of buying milk than by the gallon, which, for obvious reasons, was unsatisfactory. The test was introduced to New Zealand in 1892 and is universally used today.

Milk is graded by certificated men. By regulation at least two tests must be used: the curd test in conjunction with the reductase test or the microscopic count. In the curd test a small quantity of milk is treated in a similar manner to a vat of milk and indicates the type of curd that a supplier's milk would produce if made separately.

From the scales the milk is run direct into the cheese vat, if making raw milk cheese, and, if pasteurised, into a holding vat, whence it passes through a pasteurising and cooling unit before entering the cheese vat at the desired temperature.

Pasteurisation

Pasteurisation became general about 1913 after complaints from the trade about irregular flavours of cheese. The process was invented in 1871 and consists of heating the milk to a certain temperature and suddenly cooling it. The temperature varies according to what use the milk is to be put. In cheesemaking the method known as "Flash" pasteurisation is used and the milk is heated to 150 to 160 degrees and cooled immediately to 88 degrees F. The term pasteurisation was coined to honour the discoverer of the method, the French bacteriologist M. Louis Pasteur.

The advantages of pasteurisation are uniformity of manufacture and a more even distribution of fat, which have greatly assisted in building the reputation of New Zealand cheese for uniformity in flavour and texture. Though there are some factories making a satisfactory cheese from untreated milk, 91 per cent. of New Zealand's cheese is made from pasteurised milk.

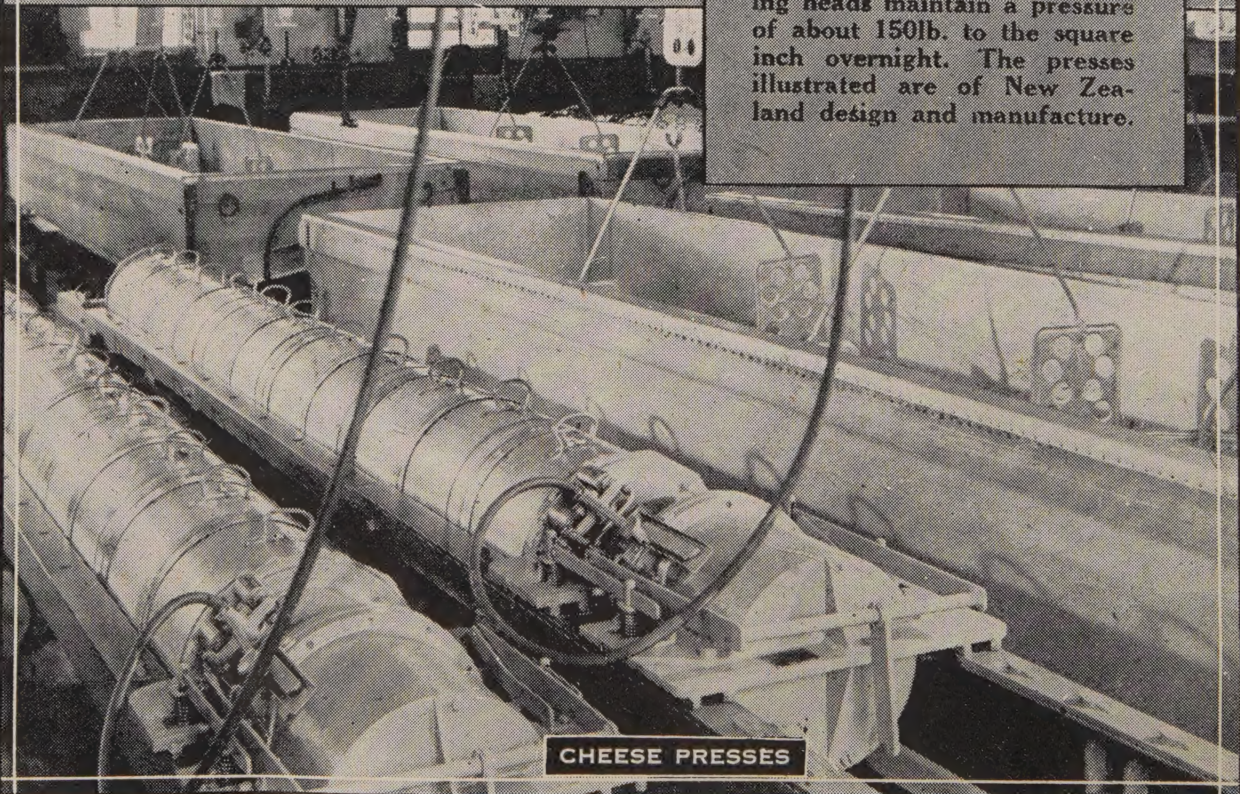
Three types of pasteurisers are in use, the open and enclosed dome machines and the more modern plate type, which has the advantage of higher regeneration.

The first type consists of two domes of tinned copper, the inner dome being fixed on a solid base, through the centre of which passes a spindle

CHEESEMAKING IN NEW ZEALAND

DRAINING CUBES OF CURD

The small cubes of curd are drained in a stainless steel vat. They have a tendency to mat together and are permitted to do so according to the cheesemaker's judgment. The time from setting to drying is about three hours. The curd is finally put into hoops lined with cheese cloth or bandage and the hoops, which are telescopic, are laid horizontally in the cheese press, in which hydraulically-operated, moving heads maintain a pressure of about 150lb. to the square inch overnight. The presses illustrated are of New Zealand design and manufacture.



CHEESE PRESSES

carrying a beater which is driven by a worm and pinion at the base. The beater revolves between the fixed and outer removable dome and prevents the milk from burning on. The milk is pumped into the cavity between the two domes and the pumping, aided by the beater, carries the milk in a thin layer through an opening in the top and over the outer dome to be collected in a tray and pumped over the cooler.

The second type, a modification of the first, has a third dome so that the milk flows downward over the heated surface, then upward in the enclosed space between the intermediate and outer domes before emerging to be cooled.

The counter-flow of hot and cold streams of milk on either side of the intermediate dome has the effect of exchanging heat from one stream to the other. This process is known as regeneration and effects savings in both heating and cooling.

The third type, sometimes referred to as a heat exchanger, also uses the principle of regeneration and is gradually replacing the earlier models because of its higher regeneration capacity and its compactness. The unit consists of a series of interlocking corrugated plates, usually of stainless steel, arranged in three groups on a metal frame. The first two groups are the heating and regenerating sections and use the same principle of exchanging heat as that used in the dome types, but the large number of plates greatly increases the surface area for heat exchanging and makes this machine much more efficient and economical than the earlier dome types. The third section of plates used for cooling the milk adds greatly to the usefulness of the machine, as it does away with the separate cooler. The stream of milk over the plates is so thin and travels at such a rate that no agitators are required to prevent burning on.

The cheese vat has evolved from the wooden tub to the standard 900-gallon rectangular metal vat. These metal vats have an inner lining of tinned or stainless steel. Steam is connected to a series of perforated pipes running lengthwise along the bottom of the vat between the outer and inner casings to control temperatures.

Adding of Starter

While the milk is flowing into the cheese vat and before adding the rennet an amount of starter, varying from 1 to 2½ per cent., is added. Essentially, starter is a culture of pure, milk-souring bacteria used to ripen the milk. It is propagated daily from selected milk heated to over 200 degrees F. and held for a period before being cooled to 70 to 75 degrees F. for inoculation with a culture of selected lactic acid organisms.

The type of culture has been improved since the time when a portion of whey from the previous day's make was saved and used to ripen the milk. Cultures of naturally-soured milk were then used and toward the close of last century commercially-prepared cultures became available. These cultures gave general satisfaction for many years, but in the early 20's openness in New Zealand cheese became very pronounced, and with the establishment of Massey College in 1927 the problem was tackled by the Dairy Research Institute.

In 1934 the institute developed a single-strain type of lactic organism, and although the use of these cultures was successful in obtaining the desired closeness, difficulty was experienced in maintaining their vitality in the factory. In 1935 Dr. Whitehead discovered the sudden failure of starters to be due to bacteriophage, and since that time a great deal of research has been done and much progress made. Scientists, with the help of Dairy Instructors, factory managers, and others, have evolved systems to combat airborne contamination whereby the cultures can be used commercially with satisfactory results, and only the passage of time will determine the merits of the systems.

For the facilities and scientific assistance the industry enjoys today credit is due to the pioneer cheesemakers of this country for carrying on and developing cheesemaking through many difficulties. However, the fundamentals of cheesemaking are much the same today as those of the pioneers, clean milk supply and the right development of acidity being essential for the production of high-grade cheese.

"Setting" of Milk

With the addition of starter and with the milk at 88 degrees F. the vat is ready for "setting." The term is used when the milk is ready for the rennet to be added, the quantity being approximately 3oz. per 100 gallons of milk, which is sufficient to coagulate the milk in 30 minutes. At this stage the milk is like junket and should be ready for cutting.. A common method to ascertain this is to see that the junket is firm and that it will break away from the side of the vat cleanly.

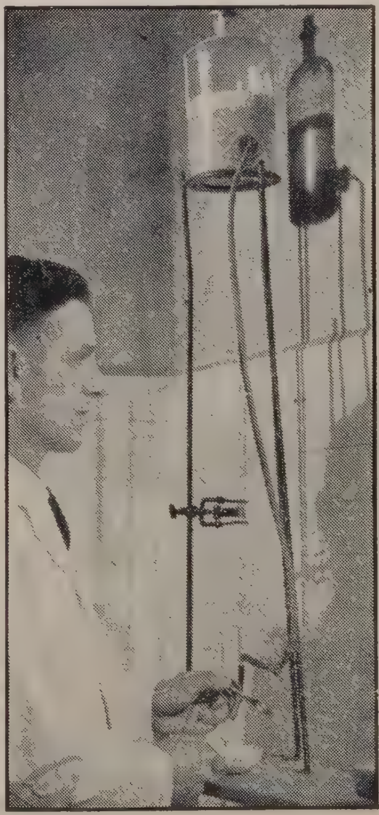
Cutting is done by two specially-designed knives, rectangular in shape and with a large number of blades. A horizontal knife is used first to cut along the length of the vat; next a cut is made across the vat with the vertical knife and then lengthwise with the same knife, resulting in ⅜in. cubes from which the whey separates readily.

Curds and whey are thus developed. It is necessary to keep the curd free to avoid matting, this being done by mechanical agitators. At the same time the curd is cooked by applying steam to the jacket of the vat, and gradually raising the temperature to 98 to 100 degrees F. The expulsion of whey from the curd is brought about by the development of acidity aided by heat.

Attention to Temperature

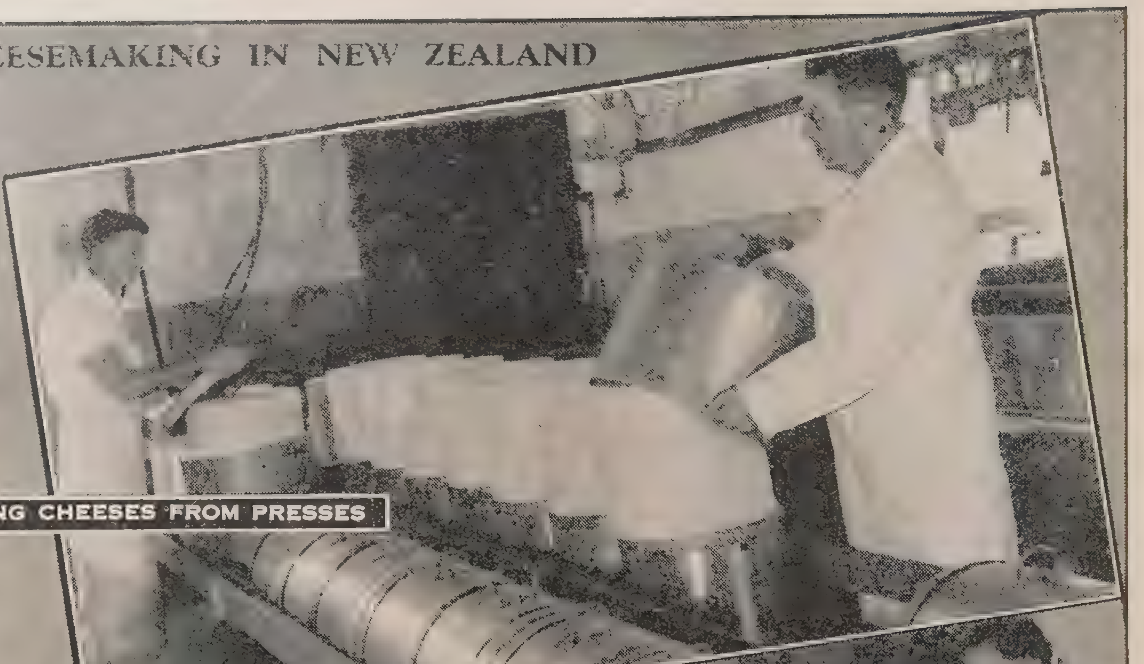
Temperature must be carefully attended to and the process from now on becomes the art of cheesemaking, it being necessary to secure the desired cook and acidity before the whey is removed, usually 2½ to 3 hours after the time of setting. The percentage of acidity at this stage controls the manufacture and determines the quality of the finished product, which varies with the season and the type of starter used. The nice judgment required in cheesemaking, especially at this stage of the process, can be gained only by experience.

On removal from the vat the whey passes to a holding tank, from where it is separated, the amount of cream from the whey representing about 5 per cent. of the total butterfat received.



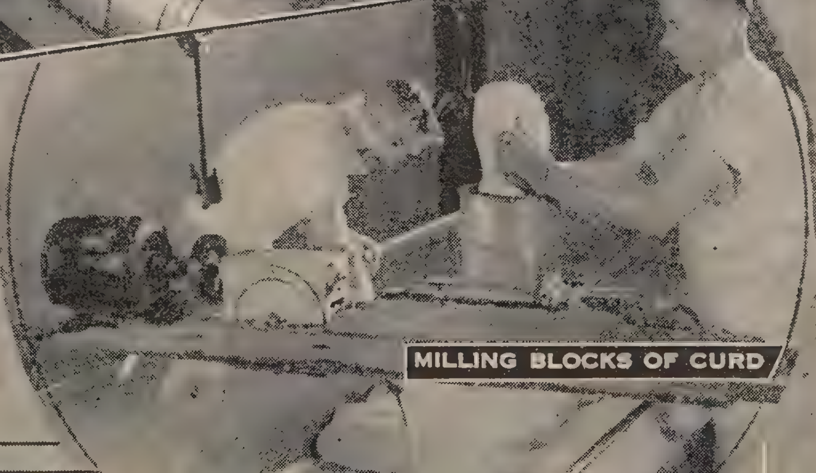
Acidity test on whey.

CHEESEMAKING IN NEW ZEALAND

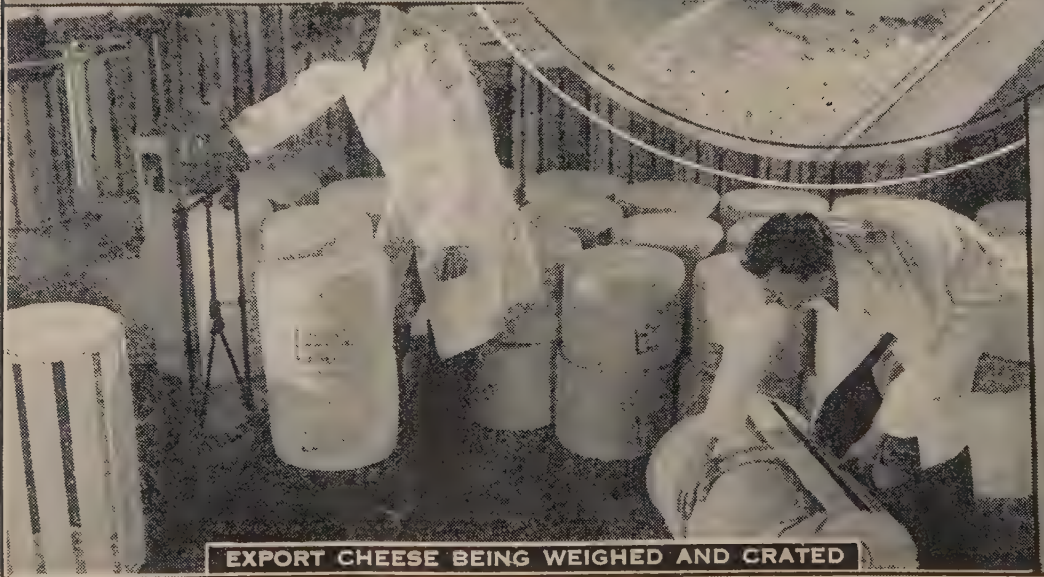


REMOVING CHEESES FROM PRESSES

When the cheese is removed from the presses the curd from the previous day has knitted together and the rind formed. Cheese for export is weighed and placed in crates which are stamped with the factory brand and registered number. Each cheese weighs about 80lb.



MILLING BLOCKS OF CURD



EXPORT CHEESE BEING WEIGHED AND CRATED

The skimmed whey is pumped to a storage tank, from which it may be drawn by farmers for pig and calf feeding. The whey cream is made into whey butter on the premises or sold to a central factory. That this is an important by-product is indicated by the fact that it represents approximately 1d. a pound butterfat.

When the whey is removed the curd passes on to the stage known as matting or cheddaring. This is an important phase in which cubes of curd which, following cooking and development of acidity, are firm and shotty, are allowed to become matted. Two hours are usually allowed for cheddaring and during that period the curd is cut into blocks to facilitate handling, and turned at intervals of from 10 to 15 minutes.

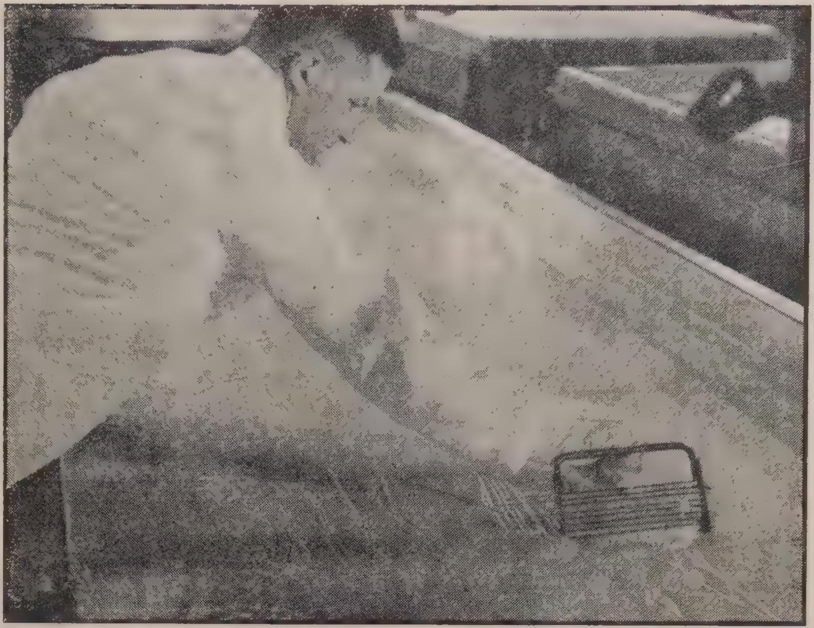
The blocks of curd, having developed the right texture, are passed through a curd mill. In this process, termed "milling the curd," the curd resembles potato chips as it comes from the mill.

The milled curd is allowed to mature for an hour or so, being well turned to prevent matting. During this process the moisture is expelled and, with further development of acidity, the curd contracts, curls, and mellows, and is ready for salting about three hours after the whey is removed.

The salt is then added, the quantity used being governed by the condition of the curd, the season of the year, and the judgment of the cheesemaker. It varies from approximately 2½lb. per 100 gallons of milk in the spring to 3½lb. and more in the autumn. The salt is evenly distributed throughout the milled curd, and when thoroughly dissolved and the curd has regained a soft velvety feel, it is ready for hooping.

Hooping the Curd

The cheese hoop comprises two steel cylinders designed so that one can slide inside the other when pressure is applied to the two perforated ends to expel the moisture and give the cheese its characteristic size and shape. An export cheese hoop makes a cheese weighing about 80lb. Before hooping the curd the hoop is lined with a cotton bandage and a round cap cloth is placed in the bottom. The bandage covering, which remains on the cheese, gives it the rind. After the hoops are filled they are laid lengthwise in a horizontal gang press and pressed for at least half an hour. The pressure is then released, the hoops lifted, and the cheese is sized. The top is neatly trimmed with a knife, a circular starched cap is placed on it, and the bandage neatly pulled smooth over the ends. The hoops are returned to the press and kept under pressure until the following day.



Cutting the curd.

The pressure is applied by a ratchet and lever and frequent pulling is needed to maintain the desired pressure. An automatic hydraulic press is fast replacing the old hand press and has the advantage of maintaining a uniform pressure.

After about 18 hours in the press the cheeses are removed from the hoops, branded with the company's registered number, vat, and date of manufacture, and placed on the shelves in the curing room. While on the shelves the cheeses are turned daily for 14 days, after which those intended for export are removed and packed. While being cured it is essential that cheese be kept clean and free from mould and at a temperature between 55 and 60 degrees F.

Curing Room

The curing room is constructed to provide light and ventilation, the more modern rooms being insulated and a number equipped with automatic temperature and humidity controls.

The container known to the trade as a crate in which cheeses are packed in pairs is peculiar to the Dominion. It is 12-sided with a length of 27in. and an average diameter of 15in., and constructed of light wooden battens nailed and wired to the two end boards and the centre board which separates the two cheeses. The factory brand, weight, and date of manufacture are branded on each end of the crate. This information is essential for identification and is required by the dairy produce grader. The points allotted by the grader for quality determine the returns to the factory.

From humble beginnings the cheese industry has progressed to a premier position in the economics of the country. In this the Dairy Division of the Department of Agriculture has played a prominent part since the early days. The Division has expanded until today its supervision extends from the farm to the consumer. Its instruction work must be closely allied to the work of the scientist too, as dairy instructors must keep pace with developments both here and overseas. In this respect the dairy chemists of the Dairy Division and the Dairy Research Institute have given valuable assistance, while the liaison maintained between scientists, dairy instructors, and factory managers has made possible the high state of efficiency which enables New Zealand to market cheese of world repute for quality and uniformity.

This does not mean that New Zealand can afford to relax her efforts. While at present there are ample markets for every country's produce, this may be only temporary, and the Dominion must prepare for the time when competition becomes keener. Consequently all interested in the cheese industry in New Zealand must redouble their efforts to produce the highest-quality product possible and maintain the reputation of New Zealand cheese.

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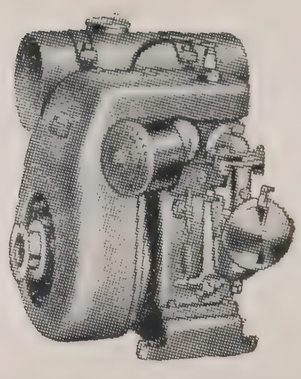

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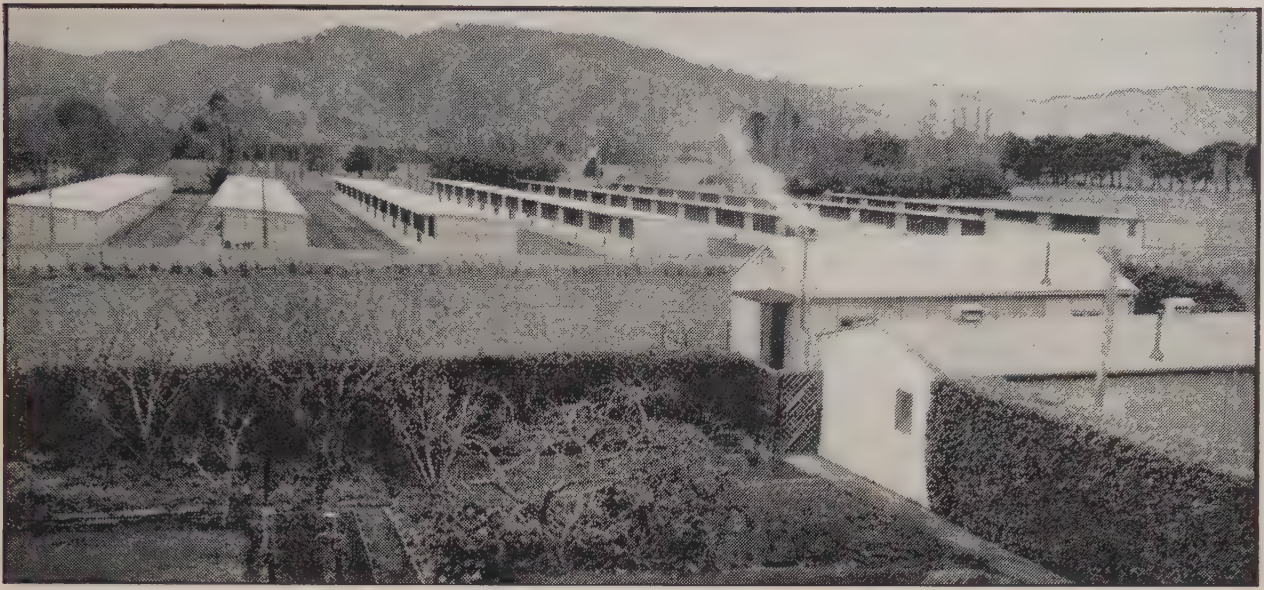

A Year's Work at Poultry Demonstration Plant

By F. C. BOBBY, *Superintendent of Poultry Husbandry, Wellington, and* E. CHAMBERS, *Manager of the Poultry Demonstration Plant, Upper Hutt.*

A YEAR ago the Department of Agriculture announced that the Table Poultry Plant, Upper Hutt, had been taken over on a permanent basis for the establishment of a practical poultry demonstration plant and a poultry breeding unit, and that the Poultry Station, Wallaceville, would be closed after its 20 years of existence and the livestock and plant transferred to the new Upper Hutt unit. The sole purpose of the Department maintaining a poultry plant of any description is to give a service to the poultry industry, including the sale of stock, demonstrations in sound husbandry, and the conducting of scientifically-planned and properly-controlled experiments. Before 1939 that was done by the Wallaceville plant, but the services had to be severely restricted during the war years. The time has arrived when those restricted services can be expanded, though unfortunately only at a greatly-reduced rate because of post-war shortages of poultry foods, which of necessity limit the number of birds maintained on the plant.

TO carry out work of interest and value to the poultry industry is but part of the service to be offered. It is equally important to ensure that information about that work reaches poultry producers throughout the Dominion. With that object it is the intention of the Department to publish an annual report setting out the many aspects of the everyday management of the plant and reviewing in detail features thought likely to be of value to poultry producers. This annual report is to be separate from any reports detailing the results of major experiments conducted at the plant. It is hoped that by this method of publicity interest in the activities of the plant will be stimulated and the benefits of its work will be within easy reach of those most concerned—poultry producers throughout New Zealand.

The biggest undertaking during the past year has been dismantling the poultry station at Wallaceville and building additional poultry housing at the new demonstration plant from the materials removed from Wallaceville. A carefully-prepared programme was drawn up and the work carried out by the amalgamated staffs of the two units. The open winter of last year and the period of fine weather which followed helped in no small degree to ensure that the programme was carried out to time and without undue difficulties.

Because of the acute food shortage no attempt was made to rear table birds, though the two large intensive houses set aside for this work at a later date have been completed against the time when they can be brought into operation. They are planned for the production of up to 12 dozen table birds weekly, while the processing building used previously for killing, plucking, and packing remains untouched and capable of handling this number.

Again, because of the food shortage, and in conformity with the appeal to poultry producers as a whole, heavy culling has been carried out throughout the year, reducing the flock to a minimum consistent with retaining sufficient birds from which to build up again as soon as the food situation is easier. That has caused the plant to look, and in fact to be, badly understocked, a feature that has been observed but appreciated by visitors

Apart from the programme of building additional housing, altering existent housing to suit new purposes, and erecting fencing, most of the paddocks of the farm have been ploughed up and resown in grass. That was considered desirable as a protection against possible troubles dormant in the surface soil, as poultry had been run on this land before its purchase by the Department.

The transfer of the stock, consisting of White Leghorns and Black Orpingtons, from Wallaceville was completed after the breeding season closed. Because of the difficulties associated with the amalgamation of the two plants no attempt was made to have breeding stock accredited under the New Zealand Poultry Flock Improvement Plan for 1946, but all breeding stock has been entered for accreditation in 1947. The replacement programme for 1946 was limited to what could reasonably be undertaken in view of the available supplies of foods and the capabilities of

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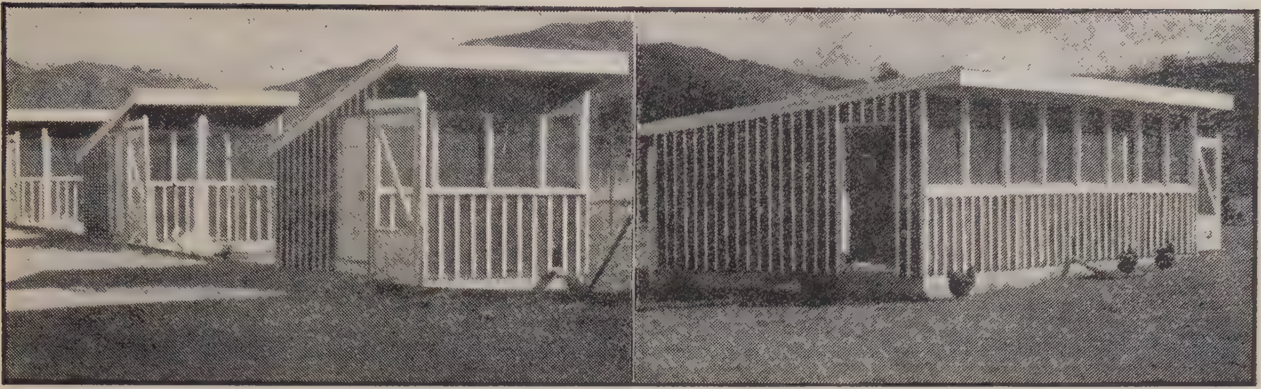


Fig. 1 (left)—Special breedings pens. Fig. 2 (right)—Trap-nest house for pullets.

the staff while engaged on a heavy reconstruction programme.

Replacements will have to be stepped up to some extent in 1947 to avoid a really serious shortage of breeding stock in the next few years. A foundation breeding flock must be established before any appreciable breeding or experimental work can be embarked on. However, there is no possibility of an additional call for food which will endanger supplies available to poultry producers in the Wellington and adjacent districts.

A number of returned servicemen received training for varying periods during the year, and one has since become an assistant poultry instructor, stationed in Wellington, after a period of additional experience at the plant.

Pedigree Breeding Unit

The establishment of the pedigree breeding unit during the past year has been a major item on the programme of reorganisation. This unit has been designed for a breeding scheme corresponding with the requests of the annual Dominion poultry conference of this year. The industry requested that the Government poultry plant, with Massey and Lincoln Agricultural Colleges, should embark on a programme of pedigree poultry breeding, including the selection of stock by progeny testing, so that they might offer producers stock of known quality. There were delegates at the conference who realised the time and labour involved in any such scheme. Some years must pass before the demonstration plant has tested stock to offer the public, but the standard of the stock offered for sale will be raised year by year as the breeding project progresses.

The unit set aside for this work consists of 10 separate breeding units (Fig. 1), having a maximum capacity of 150 breeding hens, and six laying houses for pullets with a maximum capacity of 480 birds, all of which can be trap nested. Only five trap-nest pullet houses will be in full use annually. As each house is divided into two separate units, with separate outside grass runs,, the five houses in use give 10 units for 40 birds each. Each breeding unit, therefore, will have a corresponding pullet trap-nest unit. The pullets in each unit will come from the same breeding pens and will be full sisters or not less than half sisters. Fig. 1 illustrates one of these houses, which are 24ft. x 16ft., or 12ft. x 16ft. for each unit.

In the initial stages at least, the intention is to run five breeding pens of White Leghorns and five of Black Orpingtons, with the corresponding five pullet units of each. This year, however, there are six pullet units of White Leghorns and two of Black Orpingtons. All are being trap nested.

The first stage in the breeding programme is to test different strains of White Leghorns and Black Orpingtons to select the best strains of each for pedigree breeding. Five strains of Leghorns and four of Black Orpingtons are under test this year. They have already been recorded for hatching and rearing ability; the test is now for production, egg quality, and constitution.

Marked differences are already apapparent and some of these strains are likely to be discarded. Additional strains are to be subjected to this initial test in the 1947-48 breeding and rearing season.

Farm Operations

All Black Orpington chicks required for the plant were hatched between August 19 and September 23, and White Leghorns between August 12 and September 23. During that period

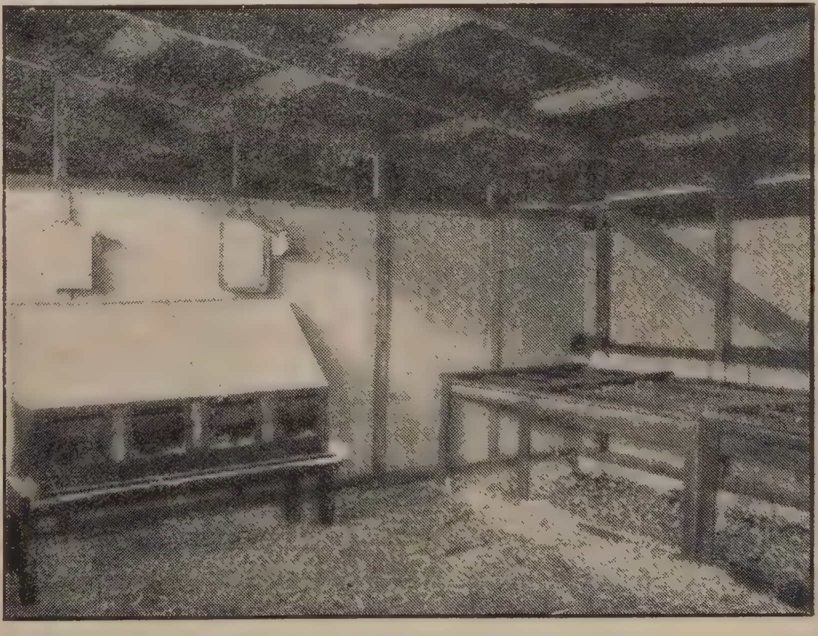
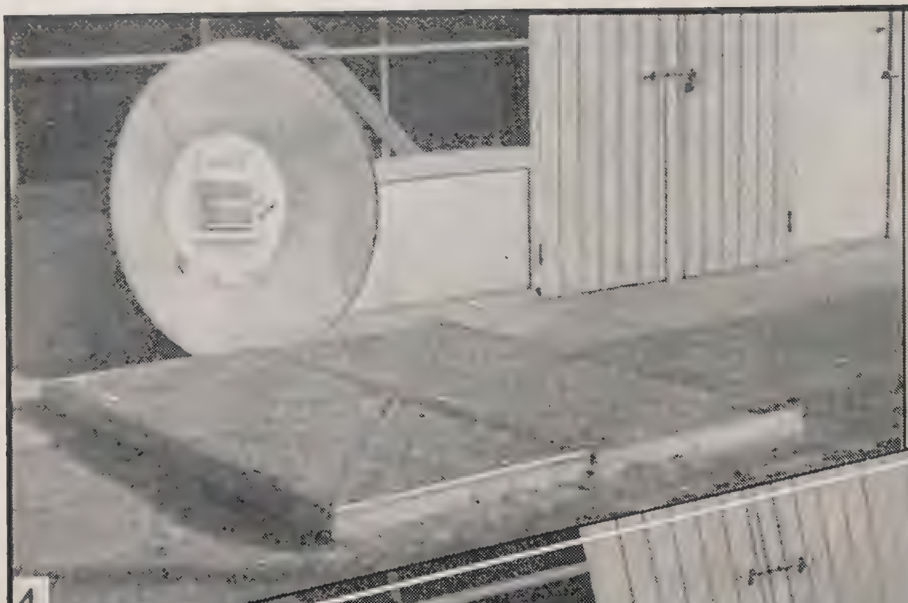


Fig. 3—Interior of trap-nest house for pullets.

WIRE FRAMES FOR BROODING CHICKENS



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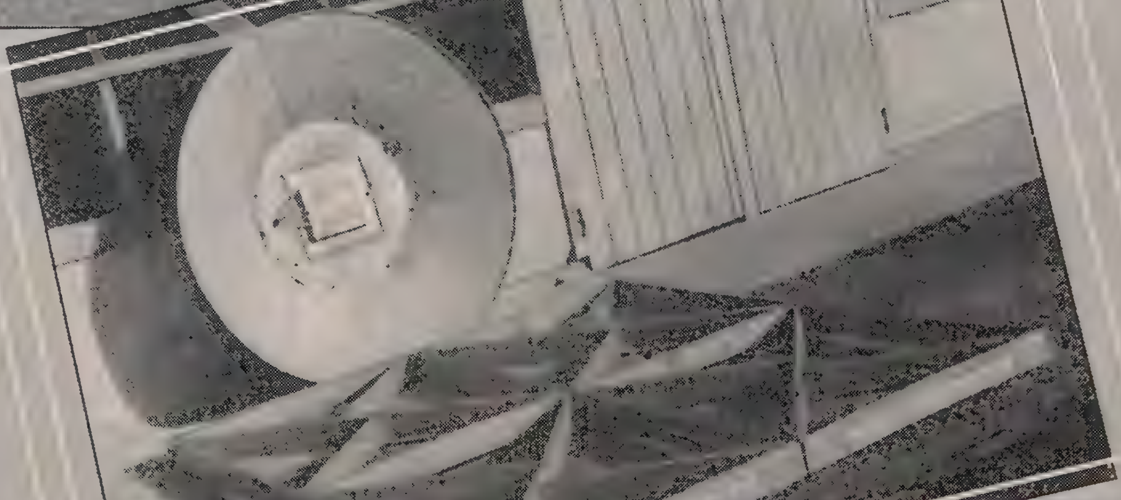

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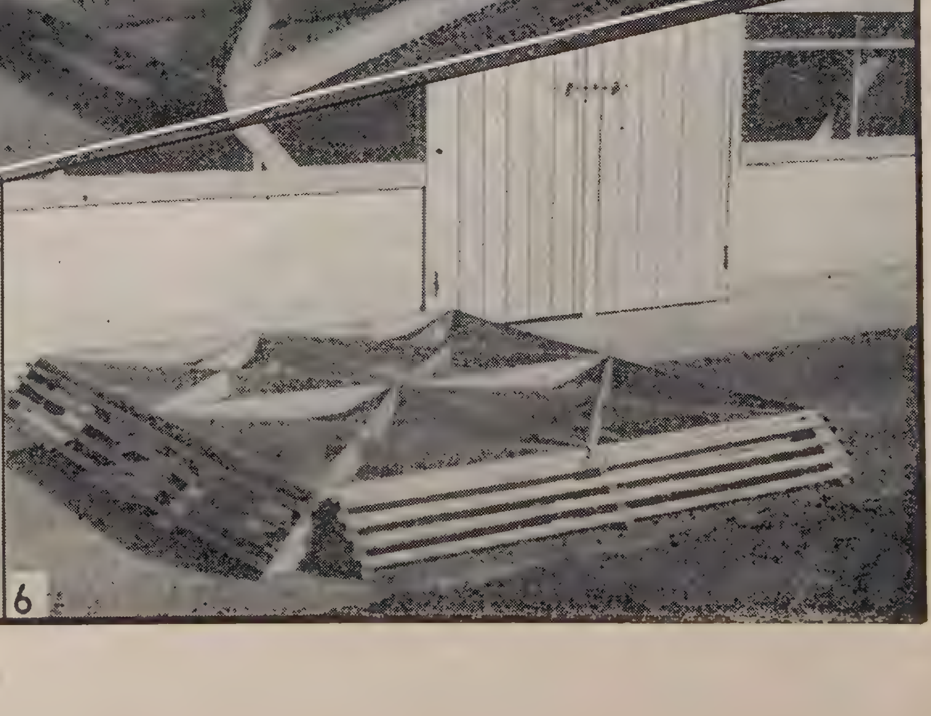

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The three stages of rearing:

Fig. 4 — Litter under the wire netting.

Fig. 5—No litter under the wire netting.

Fig. 6 — The frame raised to give increased ventilation.

no chicks were available for sale to the public, the plant's requirements being given first priority.

For this initial year (and it may have to be repeated for one more year) all chicks were brooded under intensive conditions up to about six weeks of age. As soon as is practicable the pedigree unit will include separate brooder houses with grass runs, and the chicks will go out at least after the first week. A unit to handle a maximum of 200 chicks and an electric canopy for brooding are favoured.

Wire Netting Frames

The chicks are placed on wire frames with no covering from a day old onward. The system adopted was developed by the farm manager and has now been adequately tested.

Many poultry producers have been converted to the use of the wire netting frames for brooding chickens as a means of avoiding damp floors and sweating and providing increased ventilation, but there is no method common to all who use these frames. The Department now recommends the following method, which may be described in three stages covering a brooding period of up to six weeks:—

Day-old to three days: The wire frame, in two halves, is put down in the ordinary way under the canopy with a protecting surround as shown in Fig. 4, but the space between the wire netting (which has ½in. mesh) and the floor is completely filled with litter—chopped straw. The day-old chicks are put straight on to the wire netting and no covering of sacking is used. The litter-packed space under the netting holds the heat to the chicks for the first few critical days while the birds become acclimatised.

Fourth day to 3½ weeks: The litter is removed from under the frames, leaving the chicks on the netting with increased ventilation and no possibility of sweating (Fig. 5). As the chicks start on the netting at a day old, no trouble is experienced in getting the birds to settle at dusk—in fact, they do not notice any change. If only a limited quantity of ½in. netting is available, the chicks may safely be placed on ¾in. netting frames at three weeks of age. The larger mesh has the advantage of being cleaner, as droppings pass through more easily.

Until transferred to range: The only alteration for this last period of brooding is the raising of the wire frames by 5in. from the floor by placing blocks of 3in. x 2in. wood at the corners. Run-ups are then placed against the frames as shown in Fig. 6. This ensures increased ventilation and circulation of air at a time when it is most needed. Under a controlled test, birds placed on frames raised in this manner reached better average weights than a similar group on wire frames flat on the floor.

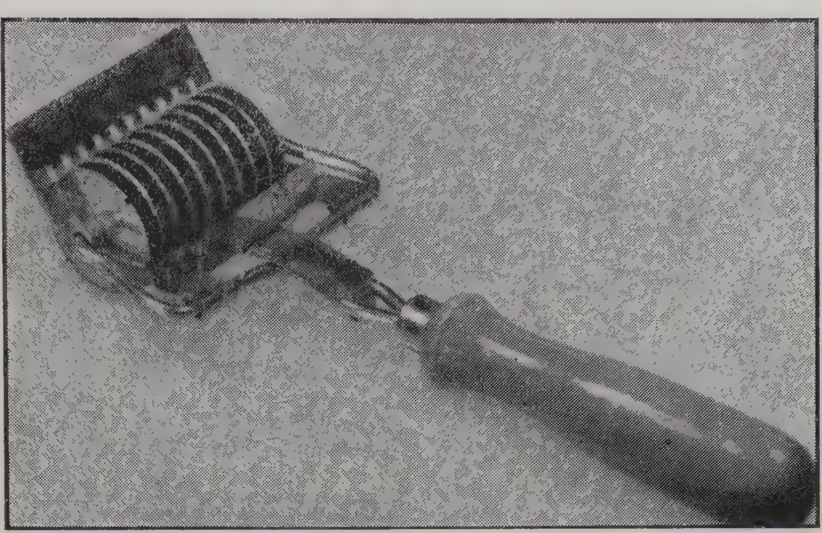

Fig. 7—Small household shredder used for cutting green food.

That description may cause poultry producers to think of the extra work and detail entailed as against simpler systems, such as frames with sacking, but the best results in chick rearing are gained only by careful and consistent attention to detail, and often extra trouble taken brings its own reward.

Summer Colony Houses

The summer colony houses used at Wallaceville, replicas of which are now to be seen on many farms in both islands, were employed for housing growing birds. When first constructed by the Department and described in a pamphlet, an obvious fault was noticed: The houses were too heavy for manhandling, because New Zealand timbers are far heavier than those used overseas for this purpose. In the building of new colony houses at the plant during the past year, *Pinus radiata* was used for all framework, employing the same sizes of timber. For the roof, instead of using sarking covered with tarred roofing material as previously, the material was battened down on the rafters and supported underneath with 2in. netting.

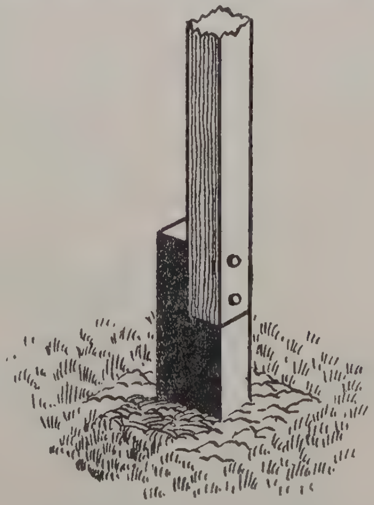

Fig. 8—Concrete base for fencing post to carry wire netting.

The weight of a house has been much reduced, and one can now be moved without undue trouble. This new construction method has also reduced the cost. Rimu must be used for the perches.

Feeding Programme

The food used at the plant, as on other poultry farms, has been restricted to the standard poultry mashes since the time of their introduction, but the system of feeding may be of interest.

All adult birds are fed as follows on week days: Early morning, light grain feed (½oz. a bird); 11 a.m.-noon, wet mash; afternoon, grain followed by green food.

On Sundays the adult stock receives only grain in two good feeds, morning and afternoon. That is not a new practice, but is quite efficient and lightens the routine work on Sundays. The birds come back to their wet mash feed on Mondays with increased relish. The change appears to rest the digestive system and stimulate the appetite.

A light grain feed in the early morning is contrary to the common practice in New Zealand, though popular overseas, but this method of feeding assists in the daily routine. Moreover, early morning is one of the

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times when birds forage in outside runs most readily, and light feed encourages that.

The feeding system used during the chicken-rearing season was: Day-old to three days, chick feed, grit, and water; fourth day to 4 weeks, grain and dry mash; until transferred to range, grain, dry mash, and one feed of wet mash at 11 a.m.

Wet mash was introduced at this stage to get the birds used to such feeding before their move to open range. Green food was fed daily after the first week—mainly green oats and silver beet, shredded in the earlier stages with the cutter illustrated in Fig. 7. This is a household utensil sold for cutting parsley, mint, etc., and available from most stores. The chickens were put on to whole wheat from five weeks onward.

When the chickens were transferred to colony houses on range the feeding programme adopted was: Early morning and 3 p.m., wet mash; 4.30-5 p.m., grain.

A little dry mash was placed in the troughs at the end of the day during the first week on range; that helps to tide over the change in feeding systems, and the birds go to roost at nightfall with less trouble. Green food was also fed on range, using freshly-cut lucerne and grass clippings.

Pinewood Fence Posts

When fencing was being erected on the plant, and all iron posts salvaged from the Wallaceville plant had been used, the problem of obtaining hardwood posts arose. These were not available, but the difficulty was overcome by using *Pinus radiata* posts bolted to concrete bases, as illustrated in Fig. 8. That has prevented rotting at ground level, while allowing posts to be replaced easily if necessary. The concrete bases can be removed from the ground and used again if the fence is pulled down; they cost 4s. 7d. on the farm.

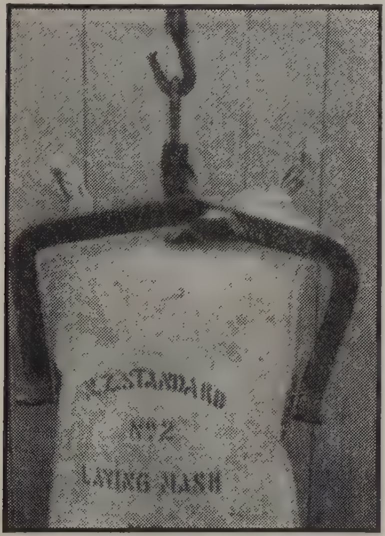

Fig. 9—Efficient and simple sack hoist grab.

New Type of Sack Grab

The food store on the plant has two floors, which necessitates the use of an electrically-driven hoist. The type of sack grab used on this hoist (Fig. 9) has been commented on favourably by visitors. It was made for the plant, and. as far as is known, such a device is not available for purchase at present. It is constructed of 1in. x ¼in. steel and includes two plates of 3in. diameter studded with spikes. The grab at the plant cost £2 10s. complete.

Proposed Breeders' Trials

The Department is giving full consideration to establishing breeders' trials at the plant in 1948. A detailed account of the conditions under which these birds will be run cannot be given at present, but the main object will be to test future breeding birds for producers. Though the competitive element of a laying trial may be introduced, it will be secondary to the testing and passing out of stock from which the owner can breed with confidence.

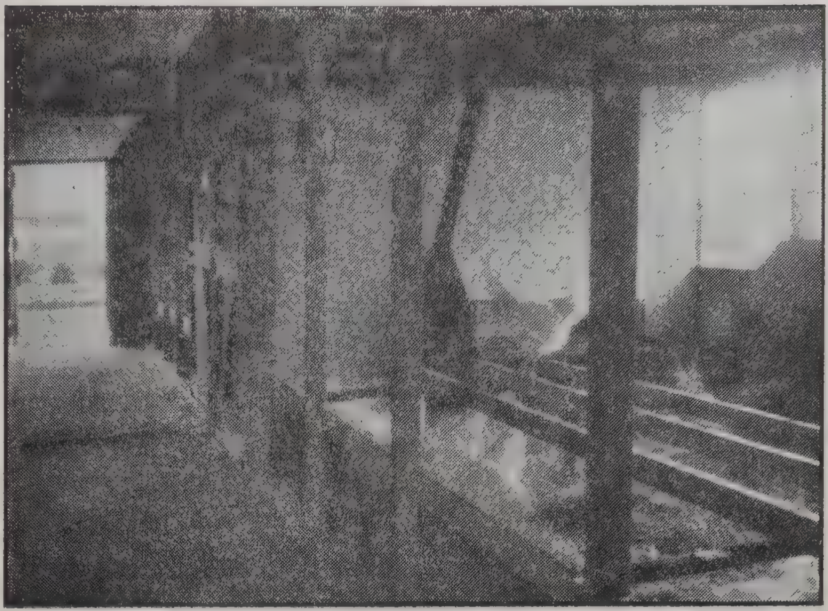

Fig. 10—Interior of house to be used for proposed breeders' trials.

Housing on the plant used during the war for raising table birds for the American Forces is being converted to carry the birds under test. It has been possible without undue labour or expense to construct pens adequate for housing 20 birds intensively (Fig. 10). Four such pens have been filled this year to test the suitability of this housing before embarking on the trials next year.

Those who have flocks accredited under the Poultry Flock Improvement Plan will be given priority among entrants to the trials. If insufficient entries are received from owners of accredited flocks, the remaining pens will be open to any poultry producers, a ballot being taken if the total entries exceed the accommodation available. It is hoped to have 72 pens available.

Full information about these proposed trials will be available in pamphlet form later.

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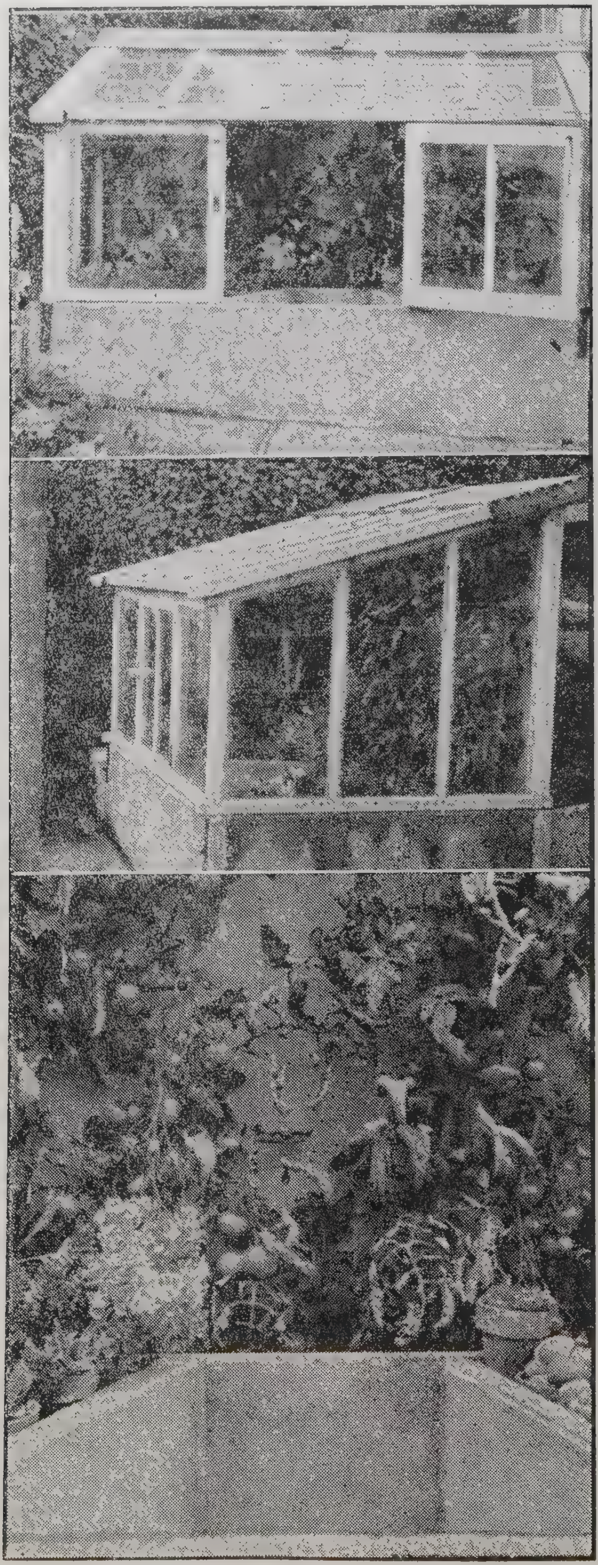
PROPAGATING FRAME FOR HOME GARDENERS

By W. G. CRAWFORD, *Instructor in Vegetable Culture, Dunedin.*

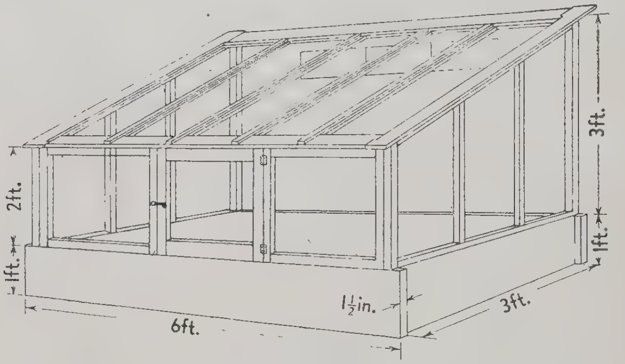


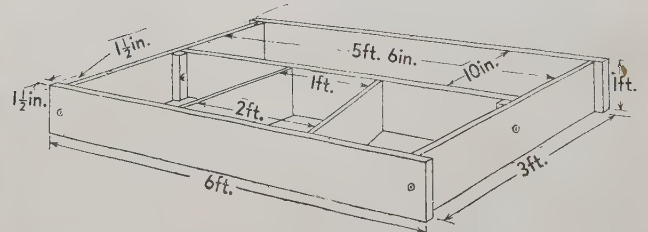
A PROPAGATING frame which will appeal to the small gardener has been devised by Mr. J. Passmore, Green Island, Dunedin.

Glasshouse construction is very expensive at the present time, but the frame illustrated can be built for a few pounds. It is not a fixture, but can be moved to any spot in the garden where it may be required.

The frame is well ventilated, its construction is simple, and it incorporates improvements on many frames now in use. The concrete soil partitions can be easily removed when cleaning out and renewing the soil. The frame should be erected in a sunny, well-sheltered position sloping gently to the north.

The frame has been used successfully by Mr. Passmore for the raising of flower and vegetable plants, for propagation of cuttings, etc., and for the growing of tomato and succulent plants.





Construction of Frame

Each unit is built as a separate frame.

The back consists of 1 sheet of asbestos board 6ft. x 3ft.

The ventilator at the back of the frame is 20in. x 8in., either hinged or sliding.

The 2ft. x 1ft. 8in. door is large enough to enable a person to step in and sit on the front concrete foundation to tend plants.

The framework is of two end stiles 4in. x 1½in.; top rail 4in. x 1½in.; and bottom rail 3in. x 1in. Fifteen sheets of 18oz. glass 14in. x 12in. are required.

The bottom frames are of 1½in. x 1½in. timber.

Californian redwood or heart black or red pine would be suitable timber to use.

Concrete should be of 5 to 1 mixture, precast 1½in. thick. Quick-setting concrete is recommended. Holes are cast in the back and front concrete slabs and bolts set in the concrete ends. Precasting minimises the boxing required, and a much better finish is obtained.

Photographs by Jack Welsh and Sons, Dunedin.

FARMING IN NEW ZEALAND

REFRIGERATION

By B. E. KING, *Rural Development Division, Christchurch.*

NEW ZEALAND'S farming history up to 1880 was dealt with in previous articles in this series, "Subsistence Farming," "The Pastoral Age," and "Cereal Production." This article describing the development of the meat and dairy export industries covers the period 1880-1900, probably the most important epoch in the country's history, for it was in the 90's that a few far-seeing men, realising that the country's future prosperity depended on the development of the meat and dairy industries, promoted closer settlement and demonstrated farm practices necessary for meat and milk production.

NEW ZEALAND farming faced a difficult situation in 1880. Although the values of wool and grain exports in the early 80's were slightly greater than at any previous time, this did not reflect a true picture of national prosperity, because their rate of growth did not keep pace with the rate of settlement and farm prices were falling faster than costs. Many of the extensively-farmed large estates on which these staples were produced were now faced with the rabbit pest and were also endeavouring to liquidate some of the debt incurred during the land boom, the weight of which had been increased by falling prices. Land-hungry settlers and workers unable to find remunerative employment were meantime facing great privation.

The most suitable farming and pastoral land of the country was in the hands of comparatively few people. Until the end of the Maori Wars in 1872 land settlement was considerably hindered in the Waikato and Taranaki, but by this date most of the immediately-accessible land in the South Island had been selected by settlers. Most of their holdings were vast and the majority of the land was held by comparatively few settlers. Even as late as 1891, 43,777 persons held an aggregate of 19,400,000 acres, and of this area about 12,800,000 acres were held by only 2259 individuals or companies.

The system of farming was at first along pastoral lines, each selector on a pastoral licence having to place a specified number of sheep on his property to prove his title. But originally there was no other restriction as to the number of runs he might acquire. These flocks multiplied rapidly until in 1881 there were 12,200,000 sheep returning about £3,000,000 from exports of wool. By 1886 the sheep had increased to 15.200,000 and the value of exports to £3,073,000. But by that date a falling tendency was already discernible in the export values, which had failed to keep pace with the increased numbers of sheep.

The other great branch of New Zealand's agricultural export industry was grain, the value of which in the 10 years 1873-1883 increased from £136,000 to a peak figure of £1,287,000. This peak figure for wheat exports was reached by efforts to develop large-scale wheat farming by mechanical means. But the prominence of wheat as an export staple in New Zealand was short lived, and except for a brief period during the South African War wheat production has since been confined to domestic requirements. Gold production declined from the peak of 1871 to 1890, being displaced by frozen meat after 1890 as the third most important export.

In 1880 there was only a small home market capable of absorbing the products of diversified farming, and distance from the export markets of the world meant concentration on wool, pelts, tallow, and grain. The marketable products of a sheep during its lifetime were only a few fleeces of wool, a pelt, and a carcass for boiling down. Because of the introduction of mechanical aids, wheat growers too required fewer labourers, and the inability of farming to absorb increasing numbers of settlers each year meant an overflow of workers on to the labour market and unemployment.

However, the introduction of refrigeration after the first trial shipment of frozen meat in 1882 brought promise of renewed prosperity to farming. New Zealand is eminently suited to the production of immense quantities of perishable foodstuffs, and with the advent of refrigeration the way was opened for the export of meat, butter, and cheese to Europe.

The initial steps in developing these export industries were difficult, and progress was made possible only through the vision and work of a few men who realised the possibilities of developing New Zealand farming along the lines of meat and dairy production based on intensively-managed grassland. To the New Zealand and Australian Land Company and Thomas Brydone, the company's New Zealand superintendent, belongs the honour of having proved the possibilities of refrigeration, the introduction of which effected a turning point of New Zealand's economy when at its lowest ebb and laid the foundations of later prosperity.

THE NEW ZEALAND AND AUSTRALIAN LAND COMPANY

New Zealand's early agricultural and pastoral history is mainly one of large land owners, some of them individuals, some syndicates, and some companies. Of the companies the New Zealand and Australian Land Company was easily the largest, owning about 580,000 acres in various parts of Southland, Otago, and Canterbury. This company, with its liberal and progressive land policy conceived and controlled by able Scotsmen in Edinburgh, played a much greater part in the initial settlement and development of the South Island than is generally realised.

In 1865 James Morton, a Glasgow merchant, sent William Saltau Davidson to New Zealand to take charge of a number of unincorporated associations in Southland and Otago, and these, later amalgamated with the Canterbury and Otago Land Association,* formerly known as Hankey and Company, formed the New Zealand holdings of the New Zealand and Australian Land Company. The company encountered many difficulties, both from the rapid changes in surroundings and from the depressed values of farm produce, especially during the prolonged slump from 1885 to 1895.

The properties of the company (see Table I) comprised some of the best land, both agricultural and pastoral, in the South Island, particularly the estates at the Levels, Totara, Pareora, Clydevale, and Edendale. Over half a million sheep, comprising Merinos, Lincolns, Border Leicesters, and Romneys, were owned by the company in the South Island, the three last-named breeds being first used by the company at a very early date in New Zealand's pastoral history. The policy of the company was a most progressive one. Proper rotations of pasture and crops were practised and only the best of English grass seeds were used in sowing down pastures.

TABLE I—NEW ZEALAND AND AUSTRALIAN LAND COMPANY: LAND HELD 1890-1891

	Freehold acres	Leasehold acres
Acton, near Rakaia, Canterbury	15,162	2,520
The Levels, near Timaru, Canterbury	60,233	11,605
Pareora, near Timaru, Canterbury	17,413	
Hakataramea, near Kurow, North Otago	24,327	70,300
Ardgowan, near Oamaru, North Otago	4,480	
Totara, near Oamaru, North Otago	10,613	158
Moeraki, near Hampden, Otago	6,666	49,355
Clydevale, near Balclutha, Otago	36,496	7,115
Kawarau, near Lake Wakatipu, Otago	454	206,910
Edendale, near Invercargill, Southland	54,214	872
Sundry small properties ..	4,119	
Totals	234,177	348,835

That the company was also progressive in its land cultivation programme is evidenced by the fact that during the 70's steam engines to draw heavy ploughs and harrows on the Edendale Estate were imported from England. This equipment proved to be much too heavy for the then undrained plains and the engines were sold to sawmillers and replaced with horses. Even such an apparently retrogressive step as the change back to horses was actually progressive, because until then oxen had been the principal draught animals in Southland.

Company's Land Policy

The company realised early that the day of vast holdings was to be only short-lived, and without the compulsion applied to other large land owners by the Liberal legislation introduced by John McKenzie, the company opened its lands early for sale or lease to small farmers, and, with the exception of the Crown, was the largest land seller in New Zealand until 1900.

It was always anxious to reduce its vast holdings by sale or lease and to promote settlement by small farmers, as it felt that no other policy would preserve the value of the properties it continued to hold. From 1878 to 1890 the company sold 112,572 acres of its freehold to 780 farmers at an average price of £6 an acre. An additional 12,789 acres were leased to 57 farmers with the right of purchase.

The Edendale Estate supplies perhaps the best example of the company's policy in this direction. Here the estate was cut up into 200- and 300-acre farms for dairy farmers who became suppliers of the company's new dairy factory. The company never abandoned its new tenants, and many farmers in the Edendale district have the magnanimity of the old Land Company to thank for their present prosperity.

The Land Company imported only the best sires for all its flocks of sheep and herds of cattle and horses. Davidson was also associated with James Little, of Corriedale Estate, North Otago, in the crossing of purebred Lincoln rams with purebred Merino ewes to produce the Corriedale breed which has since achieved world fame.

In 1878 Davidson was recalled to Scotland. Since Edendale was the largest of the company's agricultural undertakings in New Zealand, Davidson seems to have spent the greater part of his time there, perhaps to his sorrow, for he added the following footnote to his final report on Edendale:—

> What with heavy expenditure and small returns, the rabbit nuisance, the many thousands of acres of sour land, and a climate so unhealthy for young stock in the winter, that mortality absorbs all the profits which should accrue from breeding, it is regrettable that the company ever had the misfortune to buy the land in Southland.

At that time Davidson even advised the abandonment of Edendale. In the light of future developments and the fact that hundreds of prosperous farms now cover the area originally held by the company, Davidson's conclusions proved wide of the mark.

Thomas Brydone

Davidson's successor as New Zealand superintendent of the Land Company was Thomas Brydone, who was to become one of the greatest of all the pioneers. He was born in Peebles-shire, Scotland, and was brought up to agricultural and pastoral pursuits. During his earlier years he held a position in the office of a commission set up to assist land owners in England and Scotland to drain their lands more efficiently and so increase their production. Later he was land steward to the Duke of Hamilton and the Earl of Buchan. He had arrived in Dunedin in 1868 to take up a position under Davidson, who was the company's general manager and also superintendent in New Zealand.

New Zealand's exports of primary products before 1880 were confined almost wholly to wool and grain, but Brydone, quickly realising the possibilities of farming in this part of the country notwithstanding the natural deterrents mentioned by Davidson in his concluding report, saw that large tracts of land which were unprofitable in the hands of his company could be made profitable under closer settlement.

Edendale, the least profitable of the company's holdings, therefore became an experimenting ground for Brydone's ideas. Before it was any use setting up small farmers it was necessary to have some market in which they could compete, and where they would not again be smothered by wealthier land brokers. Brydone decided on dairying for cheese production as being the most favourable field. In 1881 he received official sanction to his proposal and was authorised

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*Not to be confused with the original Canterbury and Otago Colonising Associations, which had vanished by 1853.

to purchase 300 dairy cows for the Edendale Estate.

Davidson now somewhat reversed his earlier opinion of Edendale and took an active interest in the promotion of the new industry. He visited the Canadian dairying centre of Ingersoll, where he investigated the whole subject of cheesemaking. He sent out full particulars to Brydone, together with plans for a model factory and all the necessary machinery.

The original cheese factory established at Edendale cost about £1200, of which £500 was soon recouped by the Land Company's winning of the Government bonus of £500 offered for the first shipment of 50 tons or more of cheese made in a New Zealand factory by the American method and exported to England or a foreign port. Though the first cheese did not go as refrigerated cargo, but was included in a shipment of wool, it commanded top prices in London.

To give the factory sufficient supplies of milk, and because it was most difficult to get sufficient labour to milk enough cows owned by the company to make the factory pay, Brydone and the company were most anxious to settle on the Edendale Estate dairy farmers who could become factory suppliers. The carrying out of this policy materially assisted the settlement of thousands of acres as small dairy farms either by sale or lease of the land to the settlers. The company, and in particular Thomas Brydone himself, did not cease to be actively interested in the welfare of the new settlers, and Brydone pioneered the use of burnt lime as a measure to halt the decline in production figures which began a year or two later.

Liming

In collaboration with Donald MacDonald, manager of the Edendale Estate, Brydone laid down a liming trial on a 10-acre paddock in Edendale township. The lime was sown at the rate of 2 tons to the acre and the area was then sown down in grass. The results are to this day described by elderly residents of Edendale as phenomenal. Farmers who had been almost bankrupt because nothing but sorrel would grow on their farms after a year or two of cultivation now adopted the new method of liming before sowing down, and prosperity returned.

[J. Walsh photo, by courtesy of the Otago Early Settlers' Association.

Thomas Brydone, founder of the refrigerated export industries.

The company allowed Brydone to supply the lime free or to the value of each farmer's rent until liming practice was well established. The lime all came in bulk by rail and was carted by dray and spread with shovels. Thus Brydone not only pioneered the use of lime in New Zealand, but his enlightened treatment of the settlers and the great benefit they reaped ensured its use. A plate set in the wall of the new co-operative dairy factory at Edendale bears these words:

> In honour of Thomas Brydone, Pioneer of the Dairying Industry in New Zealand, to whose Foresight, Initiative, Unwavering Faith, and Determination the settlers on Edendale Plain owe a debt of Gratitude.
>
> Of him it can be truly said:
>
> "He filled the unforgiving minute
> With sixty seconds worth of distance run."

The original Edendale cheese factory was a combination of cheese factory, experimental station, and dairying school. The Land Company stipulated that employees in the factory were to be trained in all branches of cheesemaking, and many other cheese factories established soon afterward owed their initial success to the skill of company-trained men. When the Government later acceded to requests for short-course dairy schools during the winter the directors of the Edendale factory were the first to offer their services and their factory.

Besides his fostering of the establishment of the cheese industry and the introduction of liming, Thomas Brydone was to make more contributions to New Zealand's economic recovery in the 80's and to our present-day prosperity.

Commencement of Frozen Meat Trade

Davidson had been in Scotland only a short time after his return there in 1878 when he discovered that Australia had successfully exported a cargo of frozen mutton to London. Up till this time much colonial capital had been expended in unsuccessful attempts to export fresh meat from New Zealand and Australia to England, and the Land Company, in common with other owners, was each year ridding itself of surplus sheep at sacrificial prices, or simply destroying them. There were at this time several boiling-down and meat-tinning works operating at Oamaru, Timaru, and Woodlands, and although many thousands of sheep were treated at these works, their combined capacity was small in comparison with the number of sheep offering.

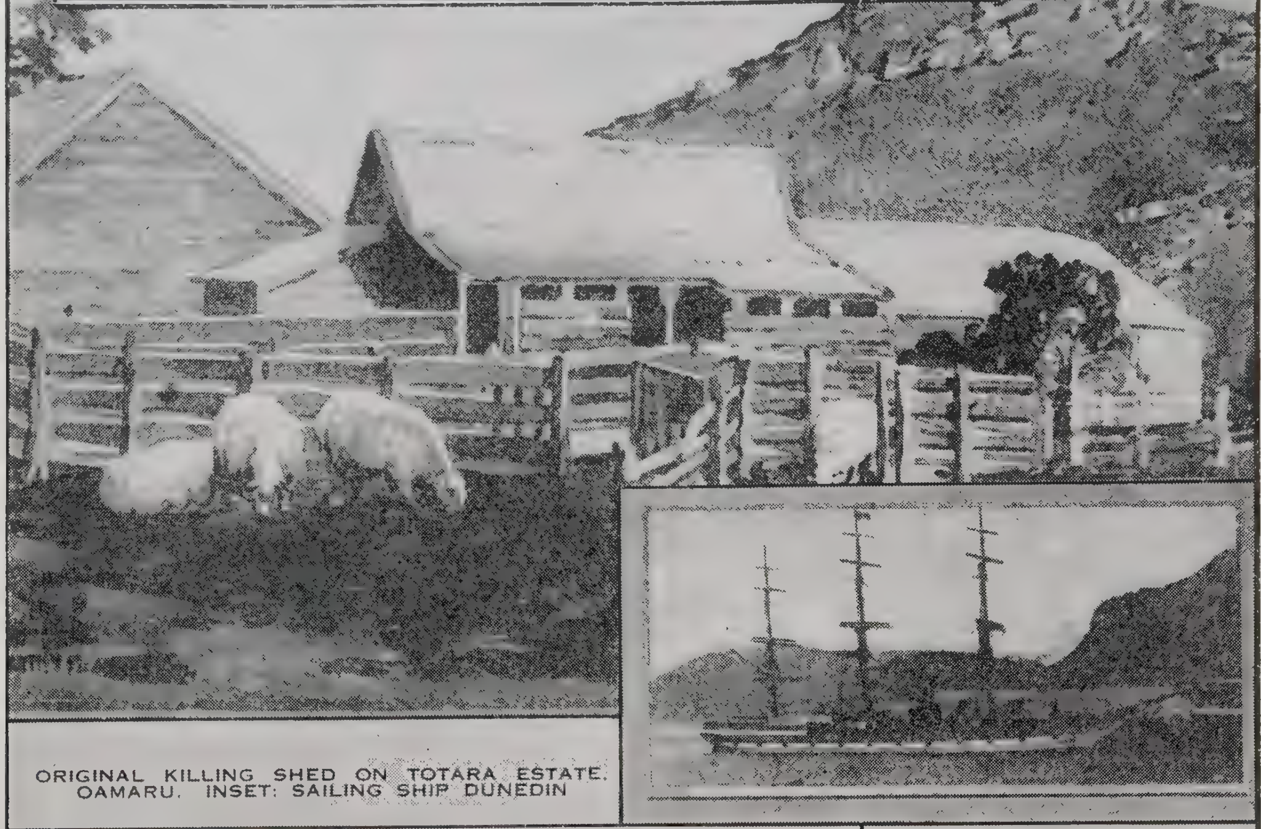
[J. Walsh photo, by courtesy of the Otago Early Settlers' Association.

Thomas Brydone Memorial Cairn on Sebastapol Hill, Oamaru.

The success of the first shipment of Australian frozen mutton to London inspired Davidson to try an experimental refrigerated cargo from New Zealand, although only sailing ships were available. At the same time Brydone visited Melbourne and Sydney to investigate the methods adopted by the Australians, and on his return to New Zealand received further advice and instructions from Davidson, who returned to New Zealand in 1881.

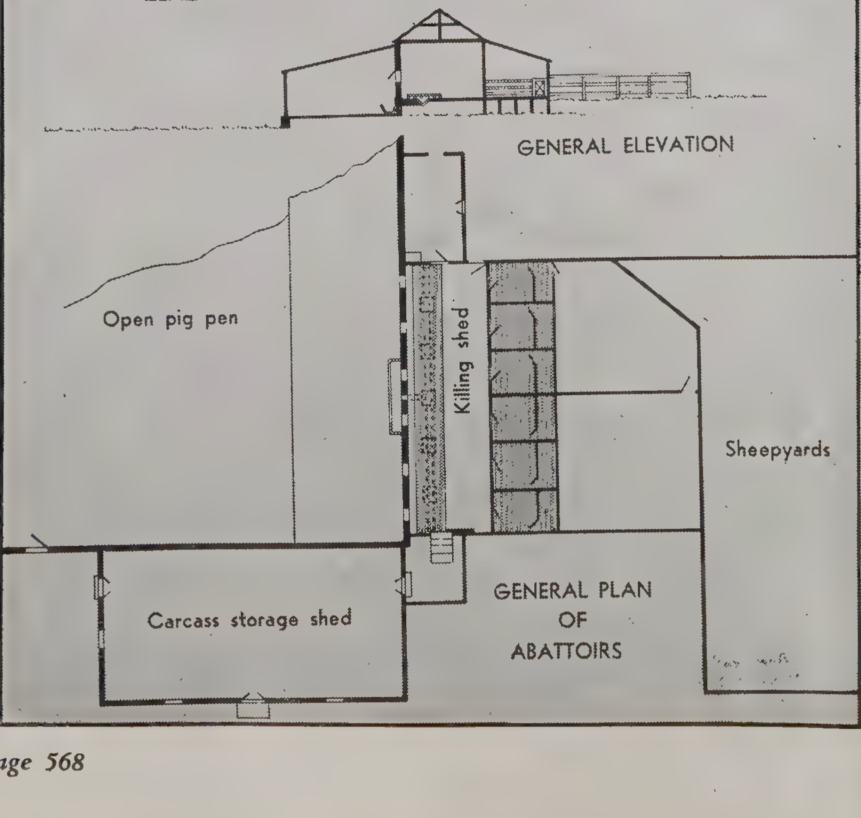
A contract was entered into with Messrs Bell and Coleman for the supply of a refrigerating plant which was shipped to New Zealand and fitted into the sailing ship Dunedin, as Brydone and Davidson had decided to freeze the mutton on board ship. These two men personally stowed the first carcasses of mutton, their main concern apparently being whether the carcasses should be stowed "fore and aft" or "athwart" the ship. When the cargo was half loaded the freezing machinery broke down and all the mutton had to be removed and sold on the wharf for what it would bring. New Zealanders, therefore, were the first to eat New Zealand frozen mutton.

FIRST NEW ZEALAND EXPORT OF FROZEN MEAT



ORIGINAL KILLING SHED ON TOTARA ESTATE, OAMARU. INSET: SAILING SHIP DUNEDIN

PLAN OF ABATTOIRS WHERE FIRST SHIPMENT OF NEW ZEALAND FROZEN MUTTON WAS KILLED IN 1882.



The first shipment of New Zealand frozen meat arrived in England by the Dunedin on May 24, 1882. The stock were slaughtered at the New Zealand and Australian Land Company's Totara Estate, Oamaru, and a cargo of about 5000 carcasses, mainly mutton, with a few lambs and pigs, was eventually successfully frozen on board. The Land Company won the New Zealand Government's bonus of £500 for the safe carriage of the first shipment of meat. The Dunedin made 10 successful trips to England with frozen meat under the company's charter before being lost at sea.

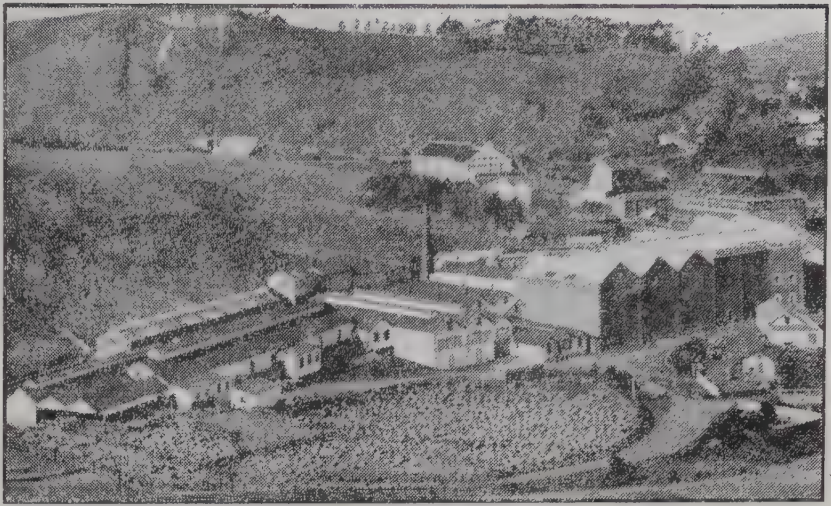
The sheep killed for this experimental cargo came from the company's Totara Estate, just outside Oamaru, and surrounding districts. John Macpherson, manager of the company's Totara Estate, also played an important part in the beginnings of the new industry. The killing shed was erected near the homestead and Macpherson, as well as overseeing the routine work of the estate, had to arrange and supervise the carriage of the mutton by rail to Port Chalmers. The newly-slaughtered carcasses were hung in a large cooling shed each night and loaded at 4 o'clock next morning into railway vans whose floors were covered with loose ice. This was most necessary as it was then the height of summer.

The Dunedin cleared Port Chalmers on February 15, 1882, and arrived in London on May 24 after a passage of 98 days. The anxiety of the captain and crew about the condition of the meat and the proper circulation of cold air while in the Tropics, and the fact that sparks from the Bell-Coleman machinery several times set the sails on fire, made the voyage a rather trying one. When unloaded in London the cargo of mutton was in perfect condition and a sale was immediately arranged at Smithfield, where the whole shipment brought top prices. London papers of that day described the feat of bringing fresh meat from New Zealand to London and in such a state that it could command top prices at Smithfield as "stupendous."

Immediately news reached New Zealand of the success of the venture the Land Company chartered another vessel, the Marlborough, and she and the Dunedin made several successful voyages to England with frozen meat before they were both lost.

By this time several freezing companies had been formed in New Zealand, some of them even before the Dunedin left New Zealand. The New Zealand Refrigerating Company, Burnside, Dunedin, the Canterbury Frozen Meat Company, the Gear Meat Company, Petone, and the Southland Frozen Meat Company were all formed late in 1881, though none of them began operations till 1882 or later.

Refrigeration and the export of frozen meat to England opened new economic horizons. At a time when the colony was at its lowest ebb, when labour markets were glutted with unemployed, and when agriculture was disheartened because of lack of markets, refrigeration gave impetus to an expansion of farming and industry in general. The frozen meat trade brought New Zealand £9,000 000 sterling during the 1885-1895 slump. By 1890 the value of frozen meat exports exceeded £1,000,000 a year, and this figure grew until by 1900 the revenue was over £2,000,000 a year.



[*C. M. Collins photo.*

One of the first freezing works in New Zealand was established at Burnside, Dunedin, in 1881-82. Buildings in left foreground are part of the original works, and further additions have been made since the photograph was taken.

History of the New Zealand frozen meat trade must be synonymous with a record of the foresight and initiative of Thomas Brydone, who was its practical founder and to whom New Zealand is greatly indebted. Brydone actively organised the New Zealand Refrigerating Company at Burnside, Dunedin, and was for many years a director of that company. His faith in the new industry never wavered, and when, in 1892, with New Zealand exporting 2,000,000 carcasses a year, it was thought that the maximum had been reached, Brydone said, "I should say there is every prospect of New Zealand being able to export 4,000,000 sheep 10 years hence as easily as we do 2,000,000 now." Brydone's optimism proved more correct.

Butter

Though the first experimental refrigerated shipment was primarily concerned with frozen meat, a small quantity of butter was included in it at the instigation of Brydone. The butter arrived in London in good order and also brought high prices on the English market. This indicated to Brydone the possibilities of this other branch of the dairy industry, but he, in common with other founders of New Zealand's export industries, was fully occupied with the production of mutton and cheese for export, and little butter beyond that required for immediate local consumption was produced. The Edendale factory was equipped from the start for the production of a certain amount of butter, but cheese was at that time a much more lucrative commodity on English markets. Until the introduction of refrigeration a certain amount of butter preserved in casks of brine was being shipped to England, and newspapers between 1870 and 1880 printed many recipes for this type of preserving for export.

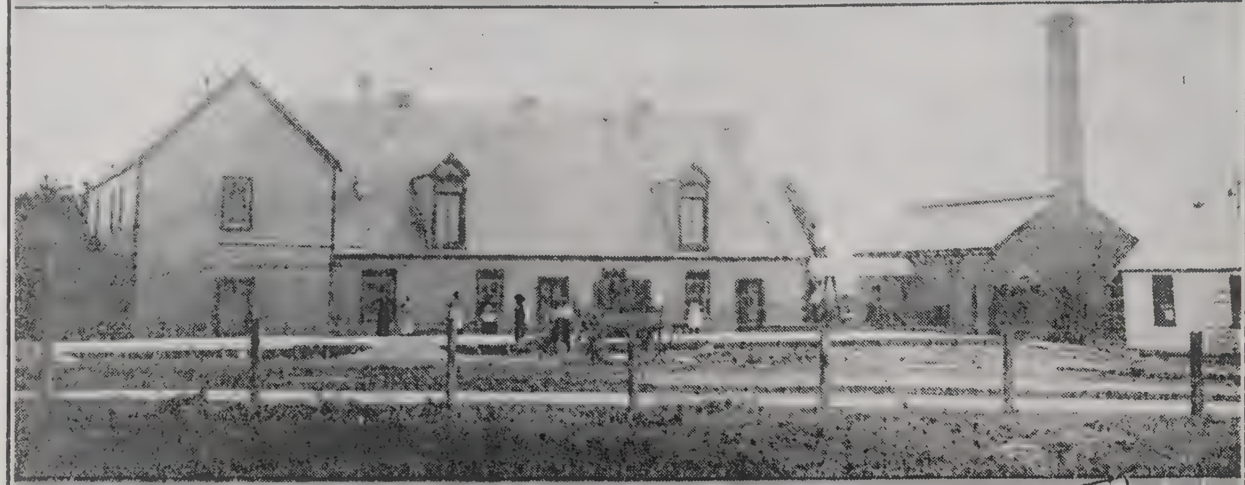
However, Brydone determined in 1889 to add butter to the list of refrigerated exports produced by the New Zealand and Australian Land Company. Realising once more the wisdom of Brydone's decision, Davidson went to Denmark for first-hand information on buttermaking.

A Danish professor of agriculture, with rare wisdom, published an article warning his people to beware of New Zealand as their most dangerous competitor on the English market and advising them to decline all information on buttermaking. Davidson, however, visited several Danish butter factories and in 1890 he sent out to Edendale a Danish expert named Andersen who first introduced Danish methods to New Zealand. The Land Company at the same time imported special machinery from Denmark for the new industry. Andersen later joined the Government instructional staff, but shortly resigned to become the first manager of the new Canterbury Central Co-operative Dairy Company at Addington.

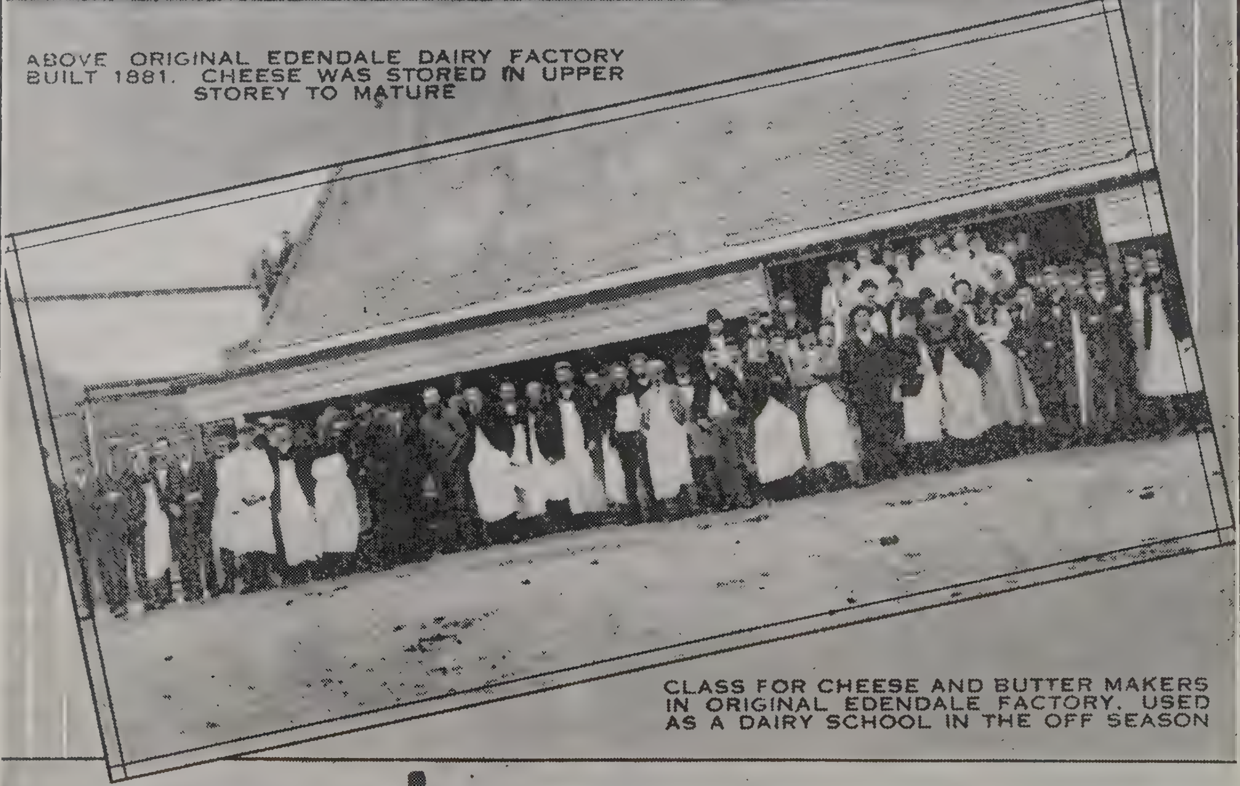
The Edendale factory ran very successfully under the New Zealand and Australian Land Company until 1903, when, as a result of the balance of the Edendale Estate being bought by the Government for closer settlement,

Illustrations on opposite page from photographs by J. Walsh—that of the killing shed from a painting by Dorothy Jones, and that of the Dunedin and the plan of the abattoirs by courtesy of the Otago Early Settlers' Association.

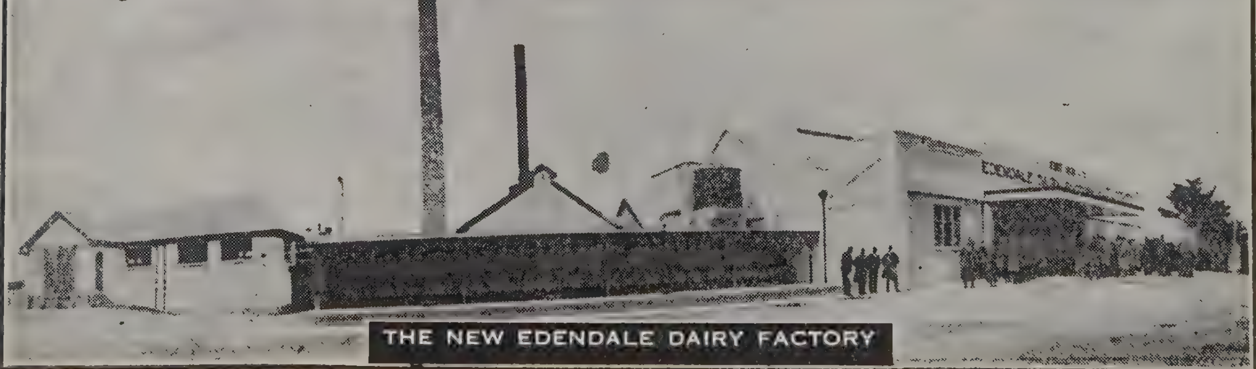
DAIRY FACTORIES AT EDENDALE



ABOVE ORIGINAL EDENDALE DAIRY FACTORY BUILT 1881. CHEESE WAS STORED IN UPPER STOREY TO MATURE



CLASS FOR CHEESE AND BUTTER MAKERS IN ORIGINAL EDENDALE FACTORY, USED AS A DAIRY SCHOOL IN THE OFF SEASON



THE NEW EDENDALE DAIRY FACTORY

a co-operative dairy company of the settlers and suppliers was formed to take it over.

With the formation of many dairy companies, mostly co-operative, in the years following 1889, exports of butter began to rival exports of cheese, until the revenue from butter exceeded that from cheese, a position that has been maintained till this day. Although Edendale was not the first butter factory in New Zealand, it was the first factory designed to produce large quantities of butter for export in refrigerated ships.

Changes in Breeding and Farm Management

At first wethers were favoured for freezing, and until 1890 the weight of mutton exported was five times that of lamb. Later in the 90's and early in the present century lamb became in greater demand on the English market, and early-maturing lambs with carcasses suitable for the London market have ever since occupied a more and more important place in the meat export trade.

The change in production from wool alone to wool and meat and the increasing emphasis on early-maturing lambs led to marked changes in breeding and feeding practices. The crossing of the Merino with long-woolled sheep for the production of half-breds, which had already commenced, was accelerated, and rams of the mutton breeds were used on these half-bred ewes for the production of fat lambs. In the South Island in this period Border Leicester and English Leicester were the favourite breeds for crossing for wether and lamb production for the export trade, and in the North Island the Romney-Lincoln cross was developed as the flock ewe on hill country to be mated with the Leicester or Southdown for the production of export lamb.

The fattening of both wethers and lambs for export required the growing of large areas of rape and turnips, and gradually sheep farming became separated into two divisions: Store sheep farmers on the hilly and poorer country supplied ewes for breeding fat lambs, store lambs, and wethers for fattening by farmers on more fertile land; these graziers on better country maintained ewe flocks by purchase from the more extensive graziers and mated them to rams of one of the mutton breeds for the production of lambs for export, fattening them on rape or turnips.

Fodder crop production increased very rapidly and Table II shows the land under annual crops between 1887 and 1901.

BREEDING AND FEEDING PRACTICES

Fattening of wethers and lambs for export required the growing of large areas of root and fodder crops, which allowed the adoption of crop rotations to maintain soil fertility.

TABLE II—LAND UNDER ANNUAL CROPS 1887-1901

Year	North Island Grain, pulse acres	North Island Root, green fodder acres	South Island Grain, pulse acres	South Island Root, green fodder acres
1887	43,400	73,500	618,500	392,900
1895	48,300	133,700	511,800	464,000
1901	75,600	182,900	645,700	582,200

The fodder crop production necessary for and made payable by the production of mutton and lamb allowed the adoption of crop rotations which maintained soil fertility. Cereals were now not the only payable crops on arable land: Rape, turnips, and short-rotation pastures of ryegrass and clovers were capable of producing good dividends, and so arose the now familiar practices of arable mixed farming. Land was left in pasture for three to four years, then broken up and sown in wheat; the wheat was followed by turnips or rape, and these crops by a spring-sown cereal, usually barley or oats, and the land resown to grass in the spring with the oats or barley. No strict rotation was followed; rape was frequently the last crop in the rotation and the land was resown to grass with the rape in November.

In the North Island fodder crops were not as essential for meat production as in the South, and development of the meat trade allowed of the profitable expansion of North Island surface-sown pasture lands. During the period there was an expansion of nearly 8,000,000 acres in sown grass, and the area sown in each province between 1887 and 1901 is shown in Table III.

TABLE III—SOWN GRASS 1887-1901

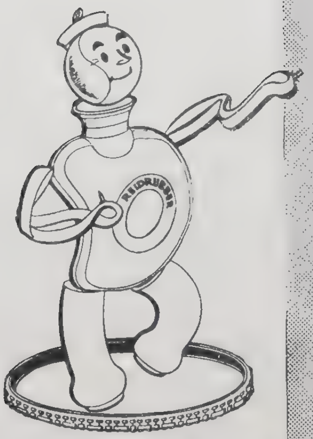
	1887 acres	1895 acres	1901 acres
Auckland ..	778,200	1,388,400	1,885,100
Taranaki ..	220,200	424,300	713,700
Hawke's Bay	834,600	1,346,900	1,705,700
Wellington ..	1,052,100	1,908,500	2,488,300
Marlborough	123,500	225,900	310,100
Nelson ..	181,300	277,100	488,700
Westland ..	10,700	19,000	50,000
Canterbury ..	1,279,400	1,714,000	1,782,000
Otago and Southland ..	1,073,600	1,525,600	1,658,400
Dominion totals	5,553,600	8,829,700	11,082,000

The greatest expansion in sown grass in the late 80's and 90's took place in the North Island, as the accessible bush lands were cleared, burned, and surface sown. This North

TABLE IV—SHEEP NUMBERS 1881-1901

	1881		1891		1901	
Auckland	535,000		1,467,000		2,079,400	
Taranaki	69,400		267,000		508,900	
Hawke's Bay	1,903,400		2,653,300		3,327,400	
Wellington	1,547,200		3,063,000		4,082,400	
Marlborough	760,800		842,700		789,200	
North Island totals		4,055,000		7,450,300		9,998,100
Nelson	631,300		898,700		841,500	
Westland	4,400		13,600		28,500	
Canterbury	3,519,400		4,307,700		3,951,000	
Otago and Southland ..	3,952,000		4,287,700		3,746,800	
South Island totals		8,867,900		10,350,400		9,357,000
Dominion totals		12,922,900		17,800,700		19,355,100

Illustrations on opposite page from photographs by Green and Hahn Ltd.



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Island development of surface-sown grasslands was reflected in the sheep numbers, and by the end of the period the North Island had surpassed the South in number of sheep carried. The details of sheep numbers in each province are set out in Table IV.

North Island farm development was also reflected in population figures, and by 1901 the North Island had 51 per cent. of the total population and the South Island 49 per cent. (see Table V).

TABLE V—EUROPEAN POPULATION: 1881-1901 (nearest 100)

	North Is.	South Is.	Percentage: North Is.	Percentage: South Is.
1881	193,000	296,600	39	61
1886	255,500	333,700	43	57
1891	285,200	348,600	45	55
1896	346,400	367,500	48	52
1901	398,800	388,600	51	49

Land Legislation

Changes in farming technique gave added point to the platform of the Liberal Party which came into power in 1893 owing largely to the organised opinion of men who wanted land. Land reform was the central part of its programme and Premier John Ballance was already an approved and experienced land reformer. The land monopoly was to be broken and land held in large estates thrown open for settlement by men many of whom were in distressed circumstances and who had been disappointed in their search for farms.

The old property taxes were repealed and a new graduated land tax imposed, designed to compel large land owners to subdivide their estates. Sir John McKenzie, Minister of Lands, followed this up by introducing a system of lease in perpetuity, the well-known 999-year lease, and at the same time an Act was passed empowering the Government to acquire any of those large estates where the Government valuation for tax purposes was disputed. Cheviot in North Canterbury was the first large estate taken by the Government under this Act and subdivided for close settlement. One of the New Zealand and Australian Land Company's estates, Ardgowan, was similarly taken in 1894. In the same year an Act was passed giving the Crown power to acquire large estates compulsorily.

A number of Amending Acts were passed between 1894 and 1899 and the combined effect of this legislation was to bring about close settlement by small farmers of many of the large estates. Land acquired by the Crown was at first leased in perpetuity or on small grazing run lease; later the renewable lease was substituted, and later still rights of freehold were given. The small farmers thus settled, anxious to carry the maximum possible number of stock on their holdings, became leaders in establishing efficient pasture rotation and improvements in drainage.

Tables VI and VII show the effectiveness of the subdivision legislation; the number of holdings over 1 acre doubled and the number of flock owners more than doubled.

TABLE VI—NUMBER OF HOLDINGS OVER 1 ACRE 1887-1900

	1887	1895	1900
Auckland	7,770	11,237	14,806
Taranaki	2,076	3,385	4,295
Hawke's Bay	1,438	2,187	3,298
Wellington	4,029	7,055	9,977
Marlborough	840	1,086	1,448
Nelson	1,898	2,526	3,084
Westland	353	418	683
Canterbury	6,967	8,624	10,965
Otago and Southland	7,961	10,158	13,929
Totals	33,332	46,676	62,485

TABLE VII—NUMBER OF SHEEP OWNERS 1883-1895

Size of Flock	1883	1890	1895
Under 500	5,039	7,662	11,336
500 to 1,000 ..	970	1,528	2,497
1,000 to 2,000 ..	609	854	1,405
2,000 to 5,000 ..	467	586	904
5,000 to 10,000 ..	244	283	341
10,000 to 20,000 ..	200	236	232
Over 20,000	149	160	183
Totals	7,678	11,309	16,898

Exports

The small farmers settled through the subdivision of large estates or given an opportnuity to earn a cash income by the inauguration of the dairy industry were helped by the rising prices of their products. Meat and dairy exports, which were insignificant in 1880, were valued at about £3,000,000 in 1900 (see Table VIII).

Rising prices and the development of the meat and dairy industries and consequent increase in value of exports made it possible for the Government to push ahead with its land settlement programme, for with dairying as a safe enterprise it was possible for settlement to proceed on comparatively small holdings.

Inspection and Instruction

The new industries called for greater farming knowledge and care than the exploitive practices of wool and cereal production. The Canterbury Agricultural College, Lincoln, was opened in 1880. Agitation for such a college had begun in the 70's and an establishment along the lines of a model farm which should be "an example of industry, intelligence, and economy" ("Country Journal," 1877) was more favoured than an actual research station. The college's activities were expanded in the early 90's to embrace much experimental work with plants and animals.

The development of the dairy industry called for Government support. At first the Provincial Governments administered at their own expense such provincial Acts as the Canterbury Scab and Catarrh Order, 1853, and the Sheep Ordnance of Otago, 1856, and maintained their own inspection staffs. On the assumption of full powers by the Central Government in 1875 the thirty provincial sheep inspectors were taken over from the various provinces and placed under the control of the Crown Lands Department, an appropriation of £7172 being made to finance their work. This appropriation was raised in 1879 to £12,000, doubtless due to the intensification of the attack on the sheep scab problem, and the control of the service was transferred to the Colonial Secretary.

The first step toward a separate Department of Agriculture was taken in 1881, when a special Stock Branch was created under the Colonial Secretary. At that time the Crown Lands Department had fairly full administrative control of farm livestock under such Acts as the Brands and Branding Act of 1880 and the Consolidated Diseased Cattle Act, 1881. Abatement of the rabbit nuisance also came within the scope of the Department.

From 1880 the Crown Lands Department had been making efforts, by engaging experts to write and lecture on particular subjects, to encourage new industries, and in 1886 an Agricultural Branch under a specially-appointed officer was set up. Promotion and improvement of dairy factories, of which there were then about 40 in operation, claimed the most attention, but silk culture, olive culture, linseed growing, and fruit culture were also fostered.

The Department of Agriculture

The Department of Agriculture was constituted in 1892 by amalgamation of the Stock and Agricultural Branches above referred to with a permanent head (J. D. Ritchie) designated Secretary of Agriculture and Chief Inspector of Stock, and with John McKenzie as Minister of Agriculture. The creation of the Department was marked by the adoption of a progressive policy of instruction and encouragement in the development of agricultural resources.

The Department of Agriculture took over the duties and the staffs of the

TABLE VIII—VALUE OF EXPORTS 1880-1900

	Wool	Grain	Frozen Meat	Butter	Cheese
	£	£	£	£	£
1880 ..	3,200,000	899,000	38,800 (preserved)	8,400	2,000
1890 ..	4,150,000	1,074,000	1,088,000	123,000	85,000
1900 ..	4,749,000	1,030,000	2,124,000	741,000	229,000

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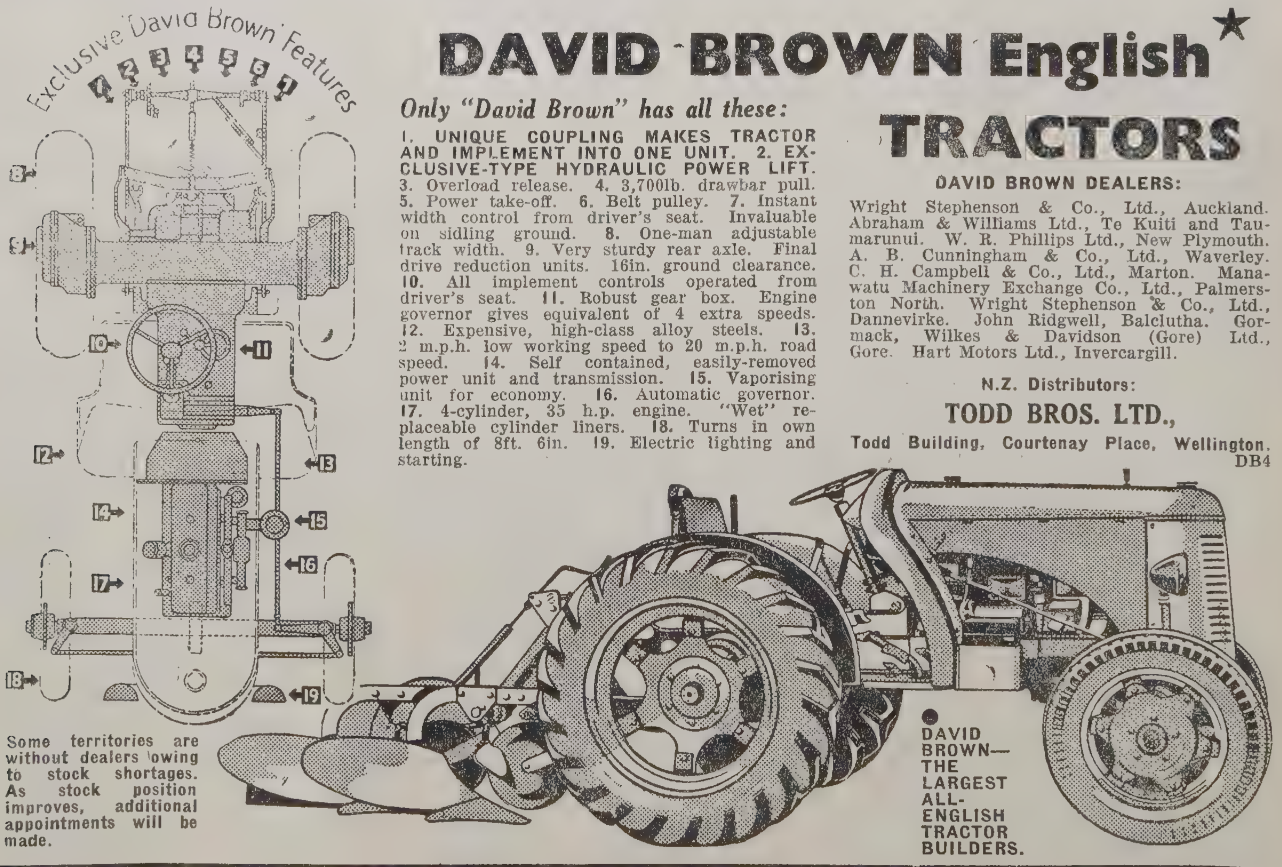

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● DAVID BROWN—THE LARGEST ALL-ENGLISH TRACTOR BUILDERS.

Stock Department and the agricultural branch of the Lands Department. The staff of the Chief Inspector of Stock at the time of amalgamation consisted of 70 officers, of whom 30 were inspectors of stock and 28 rabbit agents.

The chief functions of the Stock Department had been eradication of diseases in stock and suppression of the rabbit pest. The Agricultural Branch of the Lands Department consisted of three dairy instructors and one nurseryman. Among the officers of the agricultural branch who were to do so much for the dairy industry was John Sawers, and it was largely due to his efforts that the co-operative system of dairying was established and the National Dairy Association organised.

First attention of the new Department was devoted to the dairy industry. The first Dairy Industry Act passed in 1892 gave powers to inspectors and defined the terms "factory" and "creamery," made compulsory the registration of trade marks for butter and cheese exported, and prohibited the use of milk from diseased cows. Under an amended Dairy Industry Act passed in 1894 the grading of dairy produce was initiated. Graders were appointed and arrangements made for storage at the ports of Auckland, Wellington, Lyttelton, and Dunedin. In 1898 a further Dairy Industry Act was passed, under which power was taken to remove the control of the local milk supply from the local authority and place it under the Department of Agriculture. The same Act gave power to the Government to advance money for the erection and equipment of dairy factories, although little advantage was made of this latter provision.

[*J. Walsh photo, by courtesy of the Otago Early Settlers' Association.*

John D. Ritchie, Secretary for Agriculture, 1892-1909.

J. B. MacEwen was appointed Chief Dairy Expert in 1894 and was followed in 1898 by J. A. Ruddick, who was designated Chief Dairy Commissioner. Ruddick left the Department in 1900 and was succeeded by J. A. Kinsella.

The Stock Division was chiefly concerned with the control of livestock diseases and the rabbit nuisance. The previous Sheep, Cattle, Diseased Cattle, and Brands and Branding Acts were consolidated into the Stock Act in 1893 and came into operation on January 1, 1894. The Fencing Act and the Agricultural and Pastoral Statistics Act were passed in 1895 and the Noxious Weeds Act in 1900.

The development of the livestock industries called for the setting up of a Veterinary Division, and J. A. Gilruth and J. R. Charlton, M.R.C.V.S., were engaged as veterinarians in 1893. The Veterinary Division was constituted in 1897, and Gilruth was appointed Chief Veterinarian.

Fruit growing, wine making, poultry-keeping, and other forms of intensive farming also received attention, and a Biology and Horticulture Section was set up in 1893 with T. W. Kirk as Biologist.

The period closes with the passing of one who had been the centre of the farming revolution which was taking place in these years and who was political head of the Department until 1900. The shape of things to come in New Zealand farming was largely moulded by the work of Sir John McKenzie.

His death is recorded in the 1901 report in these terms: " . . . after much suffering born with heroic endurance he has passed away.

"On his taking office in 1890 there was no Department of Agriculture and its present position is largely due to his energy and foresight . . . If evidence were required of the success of his efforts, one has only to point to the position and importance of the dairying and other industries connected with the soil.

"That he lived to see many of the benefits derived from his work is a source of great comfort to his friends and congratulations to those interested in the welfare of the country. It is, however, immeasurably sad that he should have been called away on the eve of the full tide of his career.

"The unfailing courtesy he displayed . . . will ever be remembered."

Manufactories and Works, 1880-1900

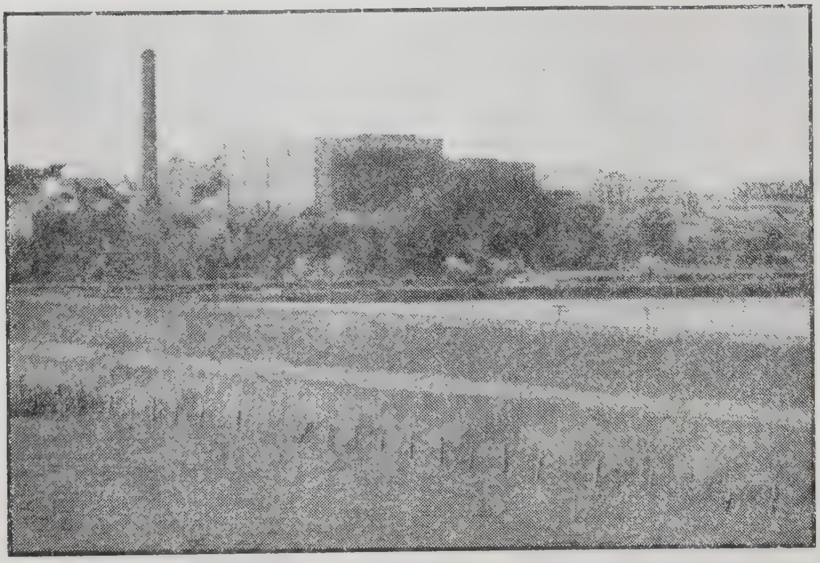
With the expansion of farming, the success of refrigeration on a commercial scale, and the increase in local population during 1880-1900 there was a considerable expansion of "manufactories and works." The development of farming stimulated the growth of an industry producing farm implements sufficiently sturdy to stand up to pioneering conditions. It provided also an expanding stream of raw materials for industries processing and handling farm products: The transport industry, woollen mills and wool-scouring works, boiling-down works and tanneries, grain mills, and later meat-freezing works and dairy factories.

Sir John McKenzie.

The combined growth of local consumer preferences and of a local market separated by high transport costs from overseas competition was also effective in stimulating industrial development within New Zealand and in providing further employment for the many artisan immigrants who had arrived. Increased population and housing construction created a demand for the products of sash and door factories, furniture works, brick works, and breweries. British footwear and clothing were not wholly suited to pioneering conditions and a more robust population, and local needs were met to a considerable extent by New Zealand factories.

Expanding transport and coal-mining industries were dependent on associated expansion in engineering workshops and iron and brass foundries, and gasworks were established.

Between 1880 and 1900 there are two marked periods of industrial expansion separated by 10 years of stagnation. During the first period bounded by the Census dates of 1881 and 1886 there was considerable expansion of employment in woollen mills and clothing factories. The availability of labour, especially female labour, unable to find employment on farms doubtless played a part in this growth, and there was some evidence of cheap, sweated labour con-



[C. M. Collins photo.

Industries processing primary products dominated all others at the beginning of this century and accounted in 1901 for £10,000,000 of the £17,000,000 total output of the principal industries of the colony. Above are the Smithfield freezing works, Timaru.

ditions. Housing construction industries and coachbuilding and printing establishments joined in the general advance, while the success of refrigeration further encouraged the growth of engineering trades, foundries, and collieries.

The deep depression which lasted through the next 10 years hindered further progress, though lack of other employment temporarily stimulated flax milling and gold prospecting, as it has always done.

In the second phase of development, 1896-1901, improvement in export prices, farm incomes, production, and trade, together with progress in land subdivision, created a housing boom, so that all branches of industry relating to housing construction enjoyed an expanded market similar to that for farm products, processing industries, and distributive trades. Dairy factory production was expanding in a remarkable fashion.

By 1901 industries processing primary products continued to dominate all others. Twelve industries directly working on farm products accounted for £10,000,000 of the £17,000,000 recorded as the total output of the "principal industries" of the colony. Most of such principal industries and the units in which production was carried out were small, as transport difficulties hindered large-scale enterprise.

The chief manufacturing industries continued to be those allied to farming, and their growth was based on an increasing farm output and on expanding population.

Summary of Period

The period 1880-1900 was a transitional one in New Zealand's farming development. The era of the large estates based on wool supplemented by grain which characterised early farming history was being completely changed by the march of events. The way had been unwittingly prepared by the public investment of the 70's. The assistance given to immigrants had provided a reservoir from which settler and farm labourer could be recruited. The cessation of the Maori Wars and the construction of roads, railways, and harbour facilities had allowed the opening up of large areas of country to mixed farming and dairy farming. The sums expended on public works and immigration and the improvement in local transport had provided the basis for land speculation.

The boom which resulted was halted by a reduction in public expenditure and falling overseas prices. The load of debt resulting from the land boom, rabbits, and in some areas serious deterioration of pasture placed large runholders generally in a difficult situation.

The commercial success of export of refrigerated meat came at a time (1884-87) when the economic pulse was beating only slowly and when unemployment was a serious problem which Ballance's special settlements were attempting to alleviate. The special settlements resembled in intention the small farms legislation of 50 years later, though there was more emphasis on group settlement than is evident in the small farms Acts. A change in Government delayed further measures along these lines until 1892, though settlement of the North Island proceeded rapidly.

By 1892 the Liberals had been returned to power on a platform which claimed to see the key to an expanding economy and reduction of unemployment in increased numbers of small independent farmers, to whom Crown lands were offered on tenures designed to assist them and to halt the land aggregation and land speculation so prevalent in the 70's. This is the explanation of the 999-year lease in perpetuity. Clauses preventing land aggregation and stipulating improvements were inserted. Compulsory repurchase of large estates for closer settlement, which was vigorously pushed ahead during McKenzie's administration, completed this programme.

By the end of the period the dairy industry was soundly established and, with the continued expansion of the meat export industry, helped to success the operations of the small farmer and furthered the trend toward closer settlement. Related development in processing industries such as meat works and dairy factories and rapid growth in export values and the flow of imports ushered in a long period of increasing prosperity and rising living standards. The period therefore ended on a note of optimism.

Acknowledgments

Thanks are expressed to many people who lent photographs and gave information which assisted the writer.

Reference Books:

"Historical Southland," F. G. Hall-Jones; New Zealand Encyclopaedia; "History of the Frozen Meat Trade," J. T. Critchell and J. Raymond; "History of the New Zealand Dairy Industry," Philpott; "The Rural Economics of Agriculture in New Zealand and Australia," Wallace; "New Zealand in Evolution," Scholefield; "A Jubilee History of South Canterbury," Anderson; William Saltau Davidson: Autobiography; the "Otago Witness," the "Otago Daily Times," and the "Oamaru Mail" of 1870 to 1900; "New Zealand in the Making," Condliffe; New Zealand Statistics: 1880-1900; Annual Reports, Department of Agriculture.

Veterinary Appointments

MR. ALLAN LESLIE, F.R.C.V.S., of Eltham, has been appointed chief veterinary executive officer to the New Zealand Veterinary Services Council. The council was set up under the Veterinary Services Act, passed by Parliament in October last, to promote and encourage the provision of efficient veterinary services to owners of livestock in New Zealand.

Mr. A. A. Blakely, B.V.Sc., has been appointed a member of the Veterinary Services Council as the representative of the Dominion Federation of Farmers Veterinary Services. He replaces Mr. Leslie, who has resigned to take up his new post as chief executive officer.

FARM TRACTORS

THE very rapid increase during recent years in the number of farm tractors in use in New Zealand has been very largely the result of the increased efficiency of the tractor and its equipment. As long as tractors were designed merely to pull implements intended to be drawn by horses, they made only slow progress, but with the advent of crawlers and rubber-tyred wheel tractors, power-take-off facilities, and specially-designed tractor implements, the tractor began to displace the horse. Other factors have been the shortage of labour, particularly skilled teamsters, and the general adoption of shorter working hours.

THE increasing use of tractors during the 1935-46 period is shown in the following table:—

Year			No. of Agricultural Tractors
1935	..	..	5,349
1936	..	..	5,710
1937	..	..	6,585
1938	..	..	8,031
1939	..	..	9,639
1940	..	..	11,278
1941	..	..	12,516
1942	..	..	13,967
1943	..	..	Not available
1944	..	..	Not available
1945	..	..	Not available
1946	..	..	18,940

During the 1942-43, 1943-44, and 1944-45 seasons, when annual statistics of farm tractors were not collected, the release of tractors was controlled by the Department of Agriculture through the District Councils of Primary Production, and the summary of tractor usage in this article is based on the information supplied by farmers to whom releases were made. During this period crawler and the higher-powered wheeled tractors were in very short supply, and rubber-tyred models were too few to meet the demand.

North Island Dairy Farms

The adoption of the tractor by dairy farmers has been one of the chief causes of the greatly-increased demand for tractors during recent years. Previously the dairy farmer kept two or three grass-fed horses for hay and silage making, fodder crop production, topdressing, pasture harrowing, and feeding out. The introduction of the rubber-tyred tractor with mower attachment and sweep provided an outfit more efficient than grass-fed horses, which were unduly fatigued in the rush of harvesting.

The tractors released to dairy farmers who previously had had a tractor were generally of a slightly higher horsepower than the tractor being replaced. The position for the chief North Island dairying districts is shown in Table I.

This demand for a higher-powered tractor was not accompanied by any very appreciable increase in the anticipated area to be harvested for hay and silage and for fodder crop production, except in Wellington, where the mean tractor horsepower for tractors released to previous users of tractors was appreciably higher than for new users. The anticipated area for hay, silage, and fodder crop production per 100 cows for the farms enumerated in Table I is set out in Table II.

During the latter part of the war the release of farm tractors was controlled by the Department of Agriculture through the District Councils of Primary Production. When applying for tractors farmers were required to supply information about their farm management practices, and this article by P. W. Smallfield, Director of the Rural Development Division, summarises the demand and estimated work for the tractors released during that period.

TABLE II—ANTICIPATED AREA TO BE CUT FOR HAY AND SILAGE AND FOR FODDER CROP PRODUCTION BY TRACTORS RELEASED TO DAIRY FARMERS

Land District	Hay and silage and fodder crops per 100 cows: Previously without Tractors (acres)	Previously with Tractors (acres)
North Auckland	41.48	41.64
Auckland ..	50.41	50.68
Taranaki	52.17	51.54
Wellington ..	52.90	59.81

TABLE I—MEAN HORSEPOWER OF TRACTORS RELEASED TO NORTH ISLAND DAIRY FARMERS

Land District		Previously without Tractors		Previously with Tractors	
		No. of Farms	Mean h.p.	No. of Farms	Mean h.p.
North Auckland	..	186	18.17	73	20.11
Auckland ..	..	443	16.21	91	18.13
Taranaki ..	..	132	16.65	16	18.88
Wellington ..	..	70	16.77	29	22.17

[*Sparrow Industrial Pictures Ltd.*

To some extent farmers were forced to accept the tractors available during this period, and the mean horsepowers for releases for groups of farms based on herd size might be misleading. In Table III the number of tractors released in each of the main horsepower groups is shown for different sized herds.

TABLE III—TRACTOR RELEASES BY HORSEPOWER AND SIZE OF HERD FOR DAIRY FARMS IN NORTH AUCKLAND, AUCKLAND, TARANAKI, AND WELLINGTON LAND DISTRICTS

Size of herd	Horsepower of Tractor: Under 12	12	16-18	20-23	25-30	Over 30
Under 30	7	6	5	1	—	—
31-40	2	16	16	12	—	—
41-50	2	37	46	16	2	3
51-60	1	51	63	36	—	2
61-70	2	54	48	32	4	1
71-80	1	53	42	27	2	1
81-90	—	36	43	32	5	—
91-100	—	35	32	24	2	—
101-150	—	56	62	47	3	3
Over 150	—	12	23	31	4	2
	15	356	380	258	22	12

The main demand, as shown in Table III, was for a tractor over 16 h.p., capable of doing general cultivation work as well as harvesting, topdressing, and feeding out. The 12-h.p. group, which is eminently suited for light work but not powerful enough for heavy cultivation, was widely distributed among farms of varying herd size, and on the larger farms was an adjunct to rather than a replacement of horses.

Hay and Silage

The anticipated area for hay and silage per 100 cows for farms to which tractors were released was above the mean for the land districts as a whole but generally about the level of that for the most intensively farmed county in each land district, as is shown in Table IV.

Dairy farming in North Auckland is not generally as intensive as in other districts; both dairy cows carried per 100 acres and hay and silage saved per 100 cows are lower than in other

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districts. The area of hay and silage saved per 100 cows in the 1943-44 season varied from none in Great Barrier County and 4.84 acres in Hokianga County to 32.96 acres in Franklin County. It would appear from Table IV that on tractor-using dairy farms in North Auckland the hay and silage provision per 100 acres approximates very closely to that of the most intensively-farmed county in the area —Franklin.

In the Auckland and Taranaki Land Districts the area of hay and silage saved per 100 cows on farms with tractors is higher than the average for the district, and is even slightly above that saved in many highly-farmed counties—Matamata 38.13 acres, Piako 38.91 acres, and Waimate West 33.96 acres for the 1943-44 season.

In the Wellington Land District annual fodder crops assumed considerable importance in the projected supplementary feeding programme on the dairy farms covered by tractor releases. Farms previously without tractors proposed to crop 20.39 acres and farms previously with tractors 24.95 acres per 100 dairy cows.

Pastoral Farms

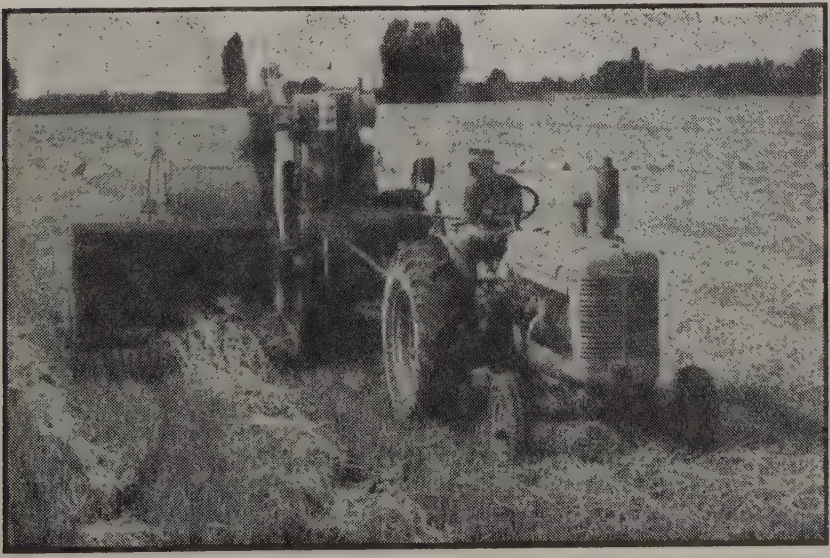
Tractor releases to pastoral farms were somewhat restricted during the period, as preference was given to food crop and butterfat production. The most interesting point in the data about releases was again that farmers who had previously had tractors required on the average a higher-powered tractor for their replacement than farmers who bought a tractor for the first time, though the work to be performed by both classes was very similar.

In the North Island the mean horsepower of tractors released to farmers who were previously without tractors was 20.33 and for farmers who previously had tractors 21.56. In the South Island the tractors for new users had a mean horsepower of 24.40 and for previous users 27.15.

The rubber-tyred tractor for mowing and sweeping has proved more efficient than grass-fed horses.

TABLE IV—HAY AND SILAGE PER 100 DAIRY COWS

Land District	Farms previously with Tractors (acres)	Farms previously without Tractors (acres)	Average for Land District 1943-44 (acres)
North Auckland	32.29	31.75	20.48
Auckland	39.40	39.82	34.49
Taranaki	44.55	43.20	36.72
Wellington	34.06	32.51	27.59



[*Green and Hahn Ltd.*

Tractors have wide use for all forms of harvesting work.

Mixed Farming

Arable mixed farms generally adopted tractors before dairy and pastoral farms, and in the control period more tractors were released to arable farmers who previously had tractors than to farmers who were buying one for the first time. In the Canterbury Land District 202 tractors were released to arable farmers buying a tractor for the first time, and 330 to farmers who previously had tractors and required either a replacement or an additional tractor.

Purchasers were somewhat restricted in the choice of tractors by shortages in some of the higher-powered types. For Canterbury farms cropping and saving seed from 101 to 150 acres, purchases were mainly divided between tractors of 23 and 30 horsepower; for farmers cropping and saving seed from 151 to 200 acres, the majority of the tractors bought were 30 horsepower or over.

Summary

The adoption of the tractor by practically all classes of New Zealand farmers does not appear to be reflected in any important change in farm management practice or production. Tractors are being used to perform the work previously done by horses. However, an analysis of the data about releases appears to indicate that in the initial purchase of a tractor the majority of farmers are inclined to start with one that is slightly underpowered for the work required.

THE PRUNING OF YOUNG BLACK CURRANT BUSHES

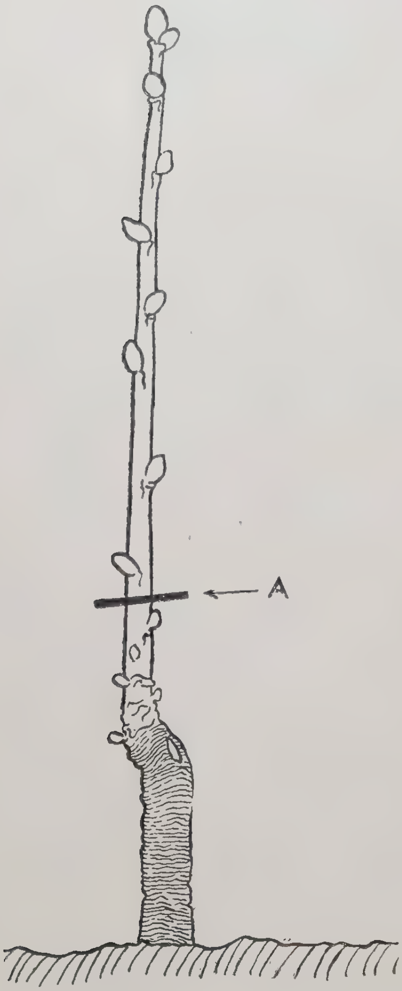


Fig. 1—A one-year-old plant.

First stage: The rooted black currant cutting should be cut down to within a few buds of the base of the new shoot (Fig. 1A) at the end of its first season, when it is a one-year-old plant.

Second stage: Many growers prefer to plant up two-year-old bushes. In that case the one-year-olds are transplanted 1ft. apart into nursery rows 2½ft. apart and cut back as shown in Fig. 1. Twelve months later, when planted out into their permanent quarters as two-year-old plants (Fig. 2), each shoot should be cut down hard at B; pieces cut off will make good cuttings for further propagating. On the other hand, if the one-year-old was planted in its permanent fruiting quarter it is still best to prune it in that way, but if the bush has grown very strongly, and it is decided to let it fruit in the following season, any shoot less than 2ft. long and at least one of the longer shoots should be cut off at B to ensure that the bush makes ample new growth in the following season as well as bearing fruit.

Third stage: Twelve months after planting a two-year-old, a nice young fruiting bush should have been produced (Fig. 3), well clothed with strong, straight shoots, some of which are produced as suckers from below the ground. All the shoots will fruit, but if they are all allowed to do so the bushes sometimes do not produce sufficient new shoots to fruit in the following season. To ensure that ample new shoots grow it is wise to cut out one strong new shoot altogether (D), and, if more than one sucker has grown, cut about half the suckers to ground level. E is a sucker growing from below ground. Short, bent, or damaged shoots should be cut off to a basal wood bud (C). If a very adverse season has prevented the young bush from becoming properly established and the new growths are short, each shoot less than 2ft. long should be cut back hard as in B, Fig. 2.

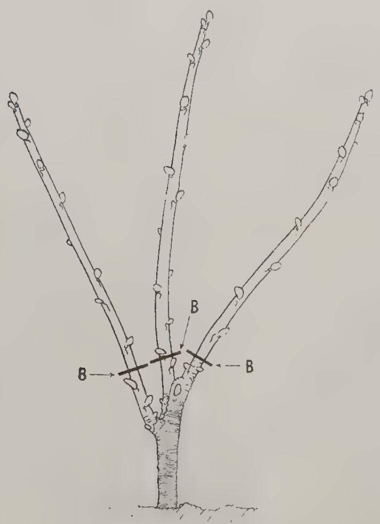


Fig. 2—A two-year-old bush.

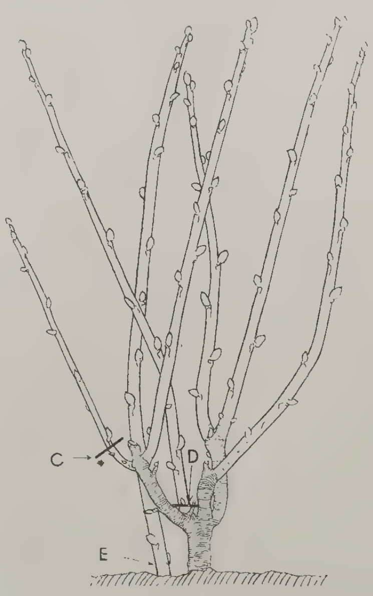
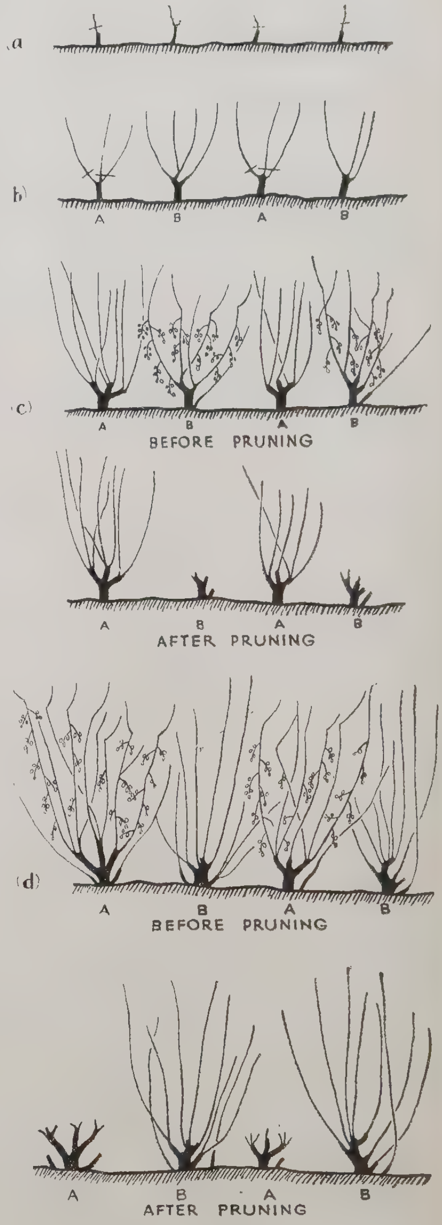


Fig. 3—A three-year-old bush.

The Duplex System



(a) When planting: Cut all bushes nearly to ground level.

(b) First autumn: Cut alternate bushes (A) nearly to ground level. Leave the others (B) unpruned.

(c) Second autumn: Cut bushes which have fruited (B) nearly to ground level. Leave the others (A) unpruned.

(d) Third autumn: As for the first autumn, cutting bushes (A) hard back and leaving bushes (B) unpruned.

Fourth autumn: As for the second autumn, and so on.

Causes of "Running off" in Black Currant Crops

THE profitability of black currant plantations depends on heaviness of cropping. Much fruit is lost each year through "running off," the causes of which are discussed in this article by J. P. Hudson, Horticulturist, Wellington. Pruning methods, especially when building up the young bushes, also influence cropping capacity by affecting the amount of fruiting wood which the bushes produce each year.

RUNNING off is one of the most serious causes of loss of crop in black currants in both commercial plantations and home gardens. Bushes may flower quite normally in the spring and show promise of a good crop, yet shortly after the flowers fade and the young fruits start to swell some or all of them damp off, leaving the bushes with few berries to come to maturity.

Many theories have been put forward about this common and serious complaint, and considerable research work has been done on the problem overseas, but there is still little knowledge on the subject.

Frosts Cause Early Running Off

Spring frosts are a common and obvious cause of running off, but in that case the flowers usually fall off very soon after they are frosted and before they start to swell. Flowers which project beyond the developing leaves, or which are exposed for any other reason, are most likely to be frosted.

When running off is caused by frost it is common to find that bunches on the inside or toward the base of the branches are comparatively untouched, while outside bunches may bear a few berries near the branches though the outer flowers all fall off. That is caused by the local protection provided by the leaves of the trusses against heat loss by radiation.

Where late spring frosts occur often it may pay in the home garden to cover black currant bushes with hessian or old sacks each evening when a frost seems likely. Once the flowers have set and the fruit starts to swell there is less likelihood of frost causing them to run off, as the young berries seem to be able to stand several more degrees of frost than the flowers.

True Running Off

Two processes have to be completed before any fruit sets. First, pollen grains have to pass from the male parts (anthers) of the flower to the stigma (part of the female organs) located in the centre of the flower. That process is called pollination. When the stigma is ready to receive the pollen it becomes moist and sticky to prevent pollen grains from dropping off. The pollen germinates on the stigma and grows down to and ultimately unites with the ovules, which then begin to mature into seeds. That process is called fertilisation.

Fruit can develop only if the flower is pollinated and if that is followed, as it normally is in currants, by fertilisation. Unless sufficient pollen grains land on the stigma of a black currant flower it can never form a ripe fruit but will sooner or later drop off, even though the young berry for a time seems to be swelling normally after the flower fades.

True running off of young black currant berries is most often caused by lack of proper fertilisation of the ovules, and the commonest reason for that is non-pollination, though the flowers seem well designed to ensure proper pollination and varieties are self fertile—that is, they do not require pollinating by some other variety.

In some varieties of currants the stigma develops on a level with, or even below, the anthers. In those varieties, which include Baldwin, the chances of pollen finding its way to the stigma, with or without insect help, are fairly high.

Importance of Bees

In other varieties, such as Boskoop Giant, Goliath, and the French types, however, the stigma is usually developed well clear of the centre of the blossom, and in those cases the transfer of pollen from anthers to stigma depends mainly on the activities of insects, especially hive and wild bees.

In districts or orchards well supplied with hive bees black currants usually set well if weather conditions are reasonable. Often, however, a spell of cold, windy weather occurs just when currant flowers are open. Bees are sluggish and reluctant to work in that sort of weather and they do not visit the flowers, which are thus not pollinated. These flowers fade, and though the berries appear at first to be swelling, they drop off during the next few weeks.

Odd bushes in warm, sheltered corners sometimes bear heavy crops when others in exposed places nearby have lost most of their berries because of running off. That is entirely the result of bees being more likely to work in warm places out of the wind and emphasises the need for shelter on a site for currant growing. It is quite likely that growers who are troubled with running off could improve their yields by keeping hive bees in their plantations.

Wild bees, which also pollinate black currants while visiting the flowers for nectar, will often work at lower temperatures or in less sheltered places than hive bees, and their activities can be of great importance to currant growers.

In one small fruit-growing district in Britain where running off is almost unknown the heavy and regular yields of black currants are attributed to the abnormally-high local population of wild bees.

Other Causes

Running off has been attributed to several other causes, but the evidence in these cases is not so clear as in the case of frost and lack of pollination.

Injury to the root system is almost certainly a potent cause of running off, especially in home gardens. A high proportion of the feeding roots is near the surface. If these roots are badly damaged by cultivation, the decreased flow of moisture and food may lead to running off. Great care should be taken both in winter digging or ploughing and in spring cultivation to avoid damage to black currant roots.

Insufficient moisture in the summer and unbalanced manuring are also said to cause running off, but experiments overseas have not proved any connection between those factors and the complaint.

Various diseases and pests, and especially a virus disease known as "reversion," are also reported as causes of running off overseas. The effect of those diseases is being closely watched in New Zealand.

BUILDING UP YOUNG BUSHES

Black currant bushes should be cut back to within a few inches of soil level as soon as they have been planted. That applies whether they are one- or two-year old bushes, as it is folly to allow newly-planted bushes to fruit in the first season, even though they look strong and vigorous when planted.

The branches of even young black currant bushes are usually well clothed with fruiting buds (larger and less pointed than wood buds), which will produce trusses of flowers in the spring after planting if allowed to do so. The strength of the newly-planted bushes would be so absorbed in developing the flowers and fruit, however, that probably little new growth would be produced.

The following year's crop of black currants always depends on the number and length of strong, vigorous, new shoots produced in the current season. The amount of fruit picked in the first season if bushes are not pruned hard when planted will be trivial, and out of all proportion to the weight of fruit which would have been produced in the second season had they been properly pruned.

By the end of the first season's growth there should be a number of strong, new shoots, some of which have grown from the stumps left in the first pruning and others from below the ground. (The latter, of course, can be produced only if the currant bushes were correctly propagated, as described in the April issue of the "Journal.") Each of these new shoots will fruit in the next season. As the bush is usually well established, with a good root system, many growers leave all the new shoots to fruit and do no pruning in the first autumn after planting. Others, however, make a practice of cutting off one complete branch to the base, or even cutting out half of the new shoots, including about half of those which have grown from below the soil. That policy is favoured, as it leads to a greatly-increased crop in the third season, though it involves a certain reduction in yield in the second.

Subsequent routine pruning of the bushes was dealt with in the February issue of the "Journal of Agriculture."

The best time for pruning young black currants is as soon as the leaves fall, and established fruiting bushes should be pruned immediately the last fruit has been picked. Black currants do not bleed appreciably even if pruned when they are still growing strongly, unlike red currants, which sometimes bleed badly if pruned at this time.

Duplex Pruning System

The normal method of pruning fruiting black currant bushes and of treating old, neglected bushes was described in the February issue. An unusual method of treating black currants, devised some years ago in Britain, might commend itself to home gardeners, as it is very simple and keeps the bushes dwarf and compact while still producing heavy crops.

Bushes are planted twice as close as usual in the rows—2 to 3ft. instead of the usual 4 to 6ft. apart, depending on the fertility of the soil. The rows are spaced the normal 6ft. apart. After being planted all the bushes are cut down to within a few inches of the ground in the usual way. Twelve months later every other plant is again cut down hard and the remainder are left untouched to fruit the following summer. These fruiting bushes are cut hard to within an inch or two of the ground after the fruit has been picked, leaving the others unpruned. This process is continued, cutting alternate bushes to the ground every year.

Under this duplex system half the bushes fruit each year while the other half throw all their energies into producing ample new shoots to fruit the following season. The system is practicable only with varieties which, under local conditions, produce an abundance of new shoots. If it is found in a particular garden that "resting" bushes do not produce sufficient new shoots, every other plant can be dug out and the remainder treated thereafter in the normal way.

Digging For Fencing Timber

By P. S. SYME, Instructor in Agriculture, Warkworth.

WITH the ever-growing shortage of supplies of good bush timber for fencing purposes many farmers are being driven to exploit underground supplies.

Throughout many districts of New Zealand there are considerable areas of swamp country containing large quantities of buried timber. Although this timber may be almost inconceivably old, much of it when dug up is found to be in a remarkably good state of preservation and practically equal to new wood in lasting properties.

While the durability of swamp timber depends to some extent on the species of tree, this is by no means the only factor involved. Farmers with a considerable experience find that even timbers of the same species and apparently equally sound when dug up may differ greatly in their lasting properties when used for fencing.

Kauri and Manawa

Although the variety of timbers found in northern swamps covers a fairly wide range and depends to some extent on the type of swamp, kauri and manawa are two of the commonest as well as the most useful species. Many farmers have found that whereas the straight-grained trunk portion of kauri is of little value for posts, it may last indefinitely when used as battens. Some farmers much prefer the lighter-coloured kauri wood to the brownish-yellow timber most commonly found, but on this point there is room for some difference of opinion. It is generally agreed, however, that although the straight-grained kauri trunk timber does not last in the ground, a twisted gummy limb on the other hand can be used confidently either for posts or strainers, and may be expected to be quite as durable as totara.

Kauri log about 70ft. long on farm of Mr. R. J. W. Taylor, Warkworth. The portion being raised was 36ft. long with a diameter of about 9ft. The great age of the log was shown by the large stump of another kauri which had grown on the covering of earth above it. The portion being raised would provide about 25,000 battens.

Manawa is a very common timber in certain swamp areas. Its reputation as a durable fencing timber has been well earned, and where it is available some experienced farmers prefer it to any other wood for posts and strainers.

IMPORTANCE OF FARM DRAINAGE

Surplus Water Checks Growth and Delays Cultivation

By E. G. SMITH, *Fields Instructor, Rangiora.*

THE provision of adequate drainage is overlooked on many properties where the need for it is obvious. Land is often seen overgrown by rushes—usually an indication of poor drainage. Many paddocks lie wet throughout winter and spring with the result that production is reduced to a marked extent.

SURPLUS water should be drained from the land, otherwise pasture growth is checked and cultivation is frequently delayed to such an extent as to make the sowing of a crop impracticable. Furthermore, if crops are sown under wet conditions, root development is restricted and the crop is slow to establish, resulting in a reduced yield. On the other hand, if suitable drainage has been carried out, less cultivation is required and crops may be sown earlier in the season. Drainage improves the physical condition of the soil and therefore land from which excess water has been removed retains the necessary soil moisture during a dry period.

A well-drained soil warms quickly in spring and retains its warmth much later in the season than a poorly-drained one. On well-drained land the response to lime and fertiliser is not only quicker but is more lasting, as less leaching occurs.

It is therefore obvious that where drainage is improved both plant growth and stock-carrying capacity are automatically promoted. Pasture growth commences earlier in spring and carries on later in the year, resulting in the production of more fodder. It is a well-known fact that stock thrive and require less feed when conditions are warm and dry.

The natural soil moisture is removed only by evaporation and plant growth. Various methods of drainage have been advocated and many have proved successful. However, few set rules can be laid down and farmers must be guided by local conditions.

Methods of Drainage

The Water Furrow: A popular method of drainage on the arable Canterbury farm is the water furrow. Although this proves useful in removing surface water, it is a poor substitute for real drainage, especially as it is frequently used on land that should be either tile or mole drained.

Mole Drainage: The mole drain is lasting and effective only where the subsoil is of a uniform stiff clay and where a satisfactory fall can be obtained from top to outlet. Under these conditions mole drainage can be highly satisfactory for a number of years, and installation costs are low. The mole drain plough is not a dear implement and its cost is usually shared by a number of farmers in a district.

The mole drain is simply a tunnel drawn in the subsoil, usually 14 to 22in. below the soil surface. It is formed by the torpedo-shaped plug attached to the mole drain plough. The diameter of the plug varies in size from 1 to 4in., but it is generally found that a 2in. plug gives satisfactory results.

Mole drainage should be undertaken when land is in good permanent pasture, but it will generally remain effective on a ploughed area. The drawing of drains is best carried out when the surface soil is dry and the subsoil is moist, as this gives a clean mole with a minimum of surface damage. If the work has been efficiently carried out, silting usually occurs only at the outlets, and it is therefore advisable to use only one in every five or six moles as an outlet. This is accomplished by making, say, every sixth mole cross the lower ends of the preceding five. When this is done it is necessary to dig down at the intersections to clear the ends of the intermediate drains. A tile should be placed at each outlet. Mole drainage is dealt with fully in Bulletin No. 170, "Mole Drainage," which is available from any office of the Department of Agriculture.

Open Drains: The open drain has many disadvantages, for example, danger to stock, the necessity for constant attention, and difficulty experienced in cultivation and top-dressing. However, when run along fence lines or on peat land where a solid bottom cannot be obtained these drains serve a useful purpose.

Fascine Drains: Fascine drainage has been widely used in districts where suitable scrub is obtainable. Material such as manuka scrub is tied in bundles and placed in an open drain so that the brush of one bundle covers the butts of the next. To avoid rotting of the scrub it is advisable to tile 3 or 4 yards at the outlets.

Stone Drains: The stone drain has been used to a limited extent. Under this system stones are placed in the bottom of the trench and are usually covered with scrub or straw before the trench is filled in.

Slab Drains: The slab drain was popular when timber supplies were plentiful. It is formed by placing a wooden slab across a narrow channel cut in the bottom of the trench.

Tile Drains: Where a solid bottom can be obtained and mole drainage is not practicable the tile drain will generally be found to be most effective. Although it requires very little fall, care must be exercised to ensure that there is not loss of fall from the highest point to the outlet, as this would result in the tiles silting up. For satisfactory results the bottom of the tile trench should be of a width just sufficient to permit convenient laying of the tiles; a wide trench allows displacement of tiles.

No rigid standard can be laid down regarding the most effective depth of drains and the distance between drains. Therefore when the drainage system is likely to be an expensive one the farmer who has had no previous experience should drain only a small area until reliable local knowledge is obtained.

Whatever method of drainage is used, a careful study of the area to be drained is necessary for success. Time spent in the taking of levels and the consideration of suitable outlets is well spent. Care must be taken to ensure that the drain is of a depth sufficient to avoid damage during cultivation. Paddocks require both individual and collective consideration and when the system is planned future expansion should receive due attention.

Strychnine-killed Rabbits Dangerous to Dogs

THE entire carcass of a rabbit poisoned by strychnine is likely to contain sufficient of the poison to harm seriously or perhaps kill a dog, but if all the organs are removed it can be safely fed out, as only minute amounts of the poison enter the meat and bones. Strychnine is a very stable poison, and partially-rotted or dried-out whole carcasses, whether on the surface or dug from burrows, will contain dangerous amounts for months or even years. On the other hand, rabbit bones from which all meat has weathered away are quite harmless to dogs.

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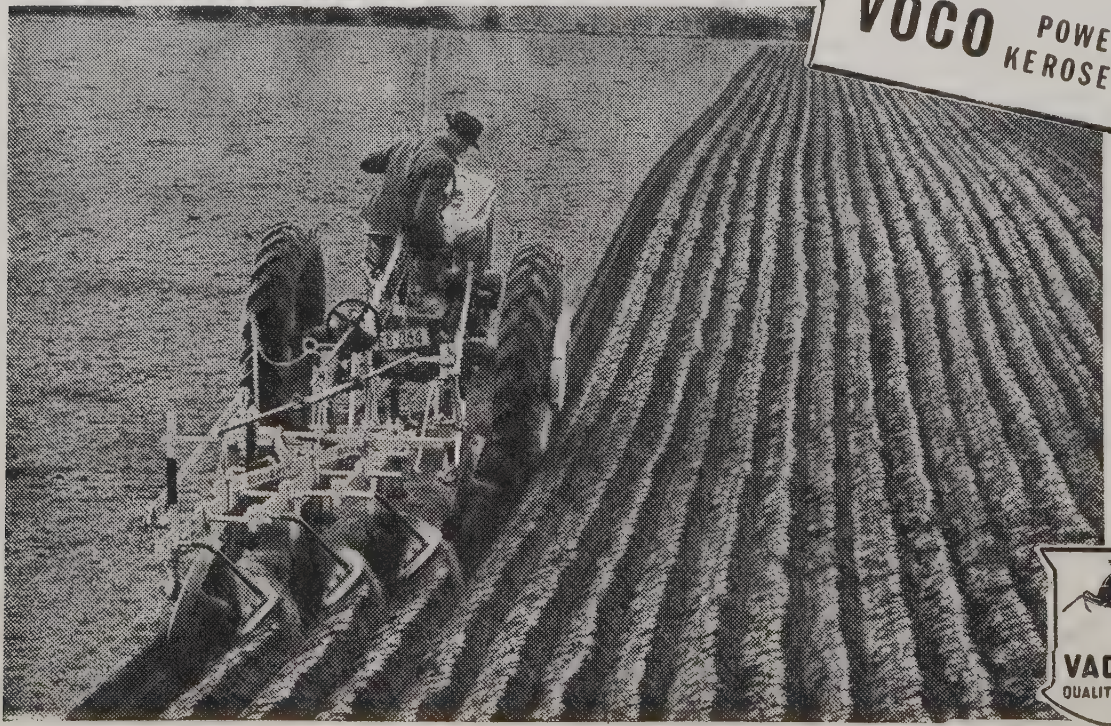

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A Working Plan for Homestead Shelter

By M. SUTHERLAND, *Farm Forestry Officer, Rural Development Division, Wellington.*

IN the opening article of this series on farm shelter (published in the March issue of the "Journal") the general principles of planning for homestead shelter were discussed, and it was shown that the ultimate growth of the trees must be considered and that lack of planning may result in costly errors in the placing of trees round the homestead—unsuitable species, badly-assorted mixtures, and planting too close to the building. In this article the planning is treated in greater detail, and, to demonstrate the use of a working plan for shelter planting around a small homestead, two possible cases are considered: One in which only a quarter-acre section can be devoted to the homestead area, and the other where a half-acre enclosure can be used. The plan is mainly for the benefit of those on whose farms Lawson's cypress will not thrive. Reference is made to the results obtained on a farm which has been planted on a somewhat similar scheme, though in this instance under coastal conditions.

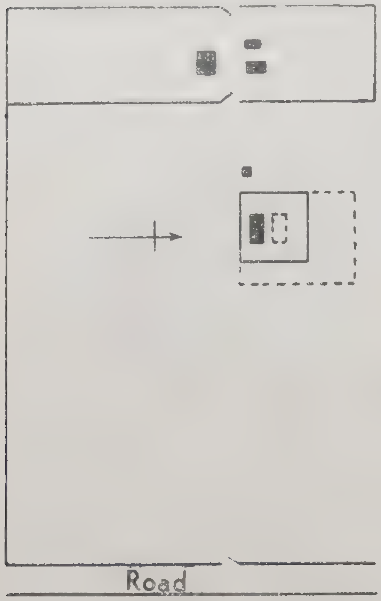
FEW people are lucky enough to have the means of laying out and arranging their farm and homestead from the beginning exactly as they wish it to be, but it will pay farmers on any type of farm to plan their shelter programme as they plan their cropping. If that is done, a substantial part of their intentions will probably eventuate, even if complete adherence to the original plan is not achieved.

New Small Holdings

At present many small farms are being constituted by the cutting up of large holdings, and the owners must subdivide, put up homes and buildings, and plan the workings of the newly-acquired farms. In many cases the farmer starts his venture when development includes merely boundary fencing, milking shed, and a house. From smaller beginnings than that many small farms in New Zealand have grown into comfortable and attractive holdings, even in 20 years or less. The development of the homestead of such a farm in 18 years is shown in Fig. 1 on page 589.

Good planning for shelter planting saves waste of effort and perhaps years of wasted growth, and that is the object of drawing up a simple working plan. The initial steps in carrying out a planting programme are usually clear cut, but the possible successive developments may not be so obvious, and difficulties arise in planning for shelter which are common to many sites and sets of conditions during the preparatory period.

This article describes a scheme for homestead shelter for a small farm



Plan 1—Plan of farm before planting. Scheme A (¼ acre) is indicated by solid lines and scheme B (½ acre) by dots.

similar to many which are at present being taken up through the subdivision of large holdings. The term "homestead" refers to that portion of the farm upon which is situated the house with its subsidiary outhouses, garage, garden, and orchard, the farm buildings in an enclosed yard or paddock, the entrance driveway and a farm access lane through the yard to fields beyond, and one or more paddocks adjoining the home block. Milking shed or woolshed is usually removed from the vicinity of the house and would be dealt with in the provision of general field shelter.

Description of Farm

The homestead block shown in Plan 1 is assumed to be on almost flat country bordering a main road, in a locality of prevailing south-west winds, with seasonal spring winds occurring from the north-west, and a mean annual rainfall of 35 to 50in. The soil has 6 to 8in. of heavy silt loam on stony gravels, fairly dry in summer, suitable in general for tree growth but not favourable for the growth of Lawson's cypress. The area is boundary fenced, with some internal subdivision, the house being five chains from the road and about midway between it and a back paddock fence.

The Home Enclosure

No house enclosure has been erected and the first decision must be the area which it is desired to keep as a home block. In present circumstances that is mainly controlled by the fencing which can be spared for the purpose and by the time which will be available during the first few years for home and garden work by the farmer or his wife. First, it is necessary to fix the minimum space necessary between fence and building to allow for developments round the house, such as pathways, back yard, drying green, lawn, and woodshed, apart from the vegetable garden, which for preference should be placed where soil is most suitable and, if possible, on an area such as a hollow where advantage can be taken of shelter from the configuration of the land.

On a small farm a quarter-acre enclosure is sufficient for present needs and presents more likelihood of the whole area being brought under control in a short time, but if a layout is completed on a small scale it is difficult to expand later on without destroying growth which is already established and flourishing—for instance, when an orchard is established in the only position possible for an access driveway. On the other hand, if half an acre is set aside around the house, though more fencing is used to enclose an area of temporarily-surplus land which must lie uncultivated for some time, this space gives scope for development around the home on a more generous scale and future expansion is easier. The possibilities for development under each set of conditions may be seen by comparing Plans 3 and 5.

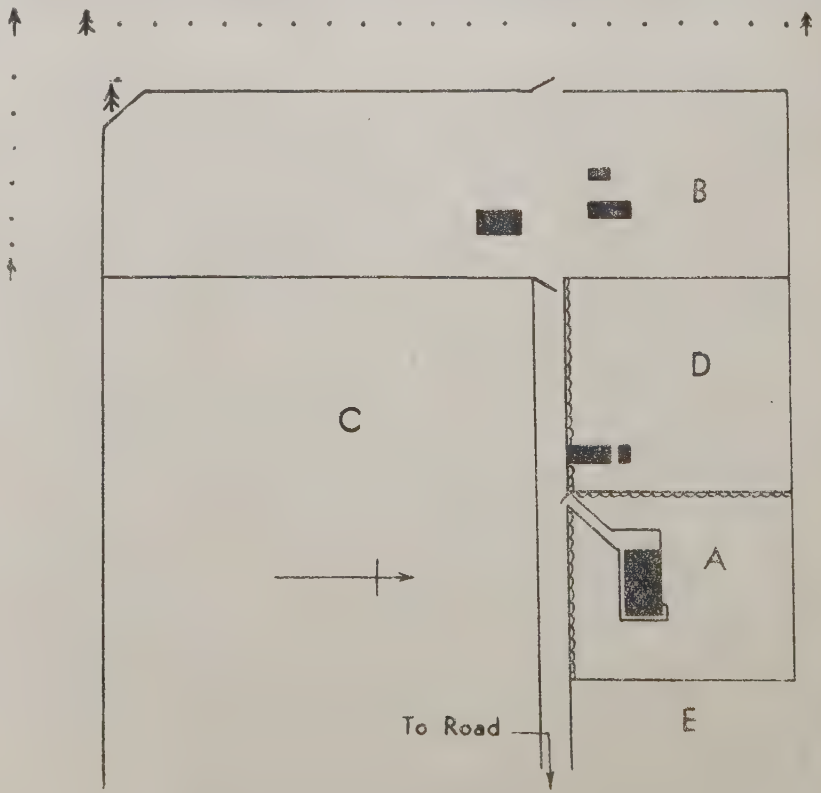
Ultimate Shelter Needs

With a house of average dimensions —about 45ft. by 25ft.—and surrounded by a fenced enclosure according to the area decided on (scheme A or B in Plan 1), it is necessary next to consider the incidence of winds and weather and decide, first where and what kind of shelter will ultimately be required, and second, where it is most urgently required, as restrictions on fencing and labour will limit the early years' work to only a small proportion of the whole programme.

The position of house shelter must be considered in relation to the other units or groups within the homestead, to the use made of adjoining paddocks, and to the possible incorporation of an access driveway as a unit in the shelter system. (See Fig. 2.) The whole appearance of the homestead environs from the road is also a consideration.

High Shelter

The prevailing wind blows from the south-west, with seasonal spring winds



Plan 2 (scheme A)—Initial planting.

KEY TO ALL PLANS

Pinus radiata	↑
Macrocarpa	↟
Eucalyptus	♀
Orchard	♀
Deciduous	○
Native tree	▨
Native conifer	0
Small fruit	○
Hedge	∼∼∼
Barberry hedge	⊖⊖⊖
Shrub	8
Conifer shrub	0
Cattle stop	≡
Pampas	Ψ

from the north-west, and the farm buildings are to windward of the house and at a distance which allows the shelter eventually to protect both. With a practically-flat area, planting on ridges or gullies can give no assistance, so the working plan calls for the provision of high shelter to the south and west to deflect the wind upward and carry it over a sheltered zone in the adjoining paddock.

Results of research to date would indicate that a partially-sheltered zone extends from a tree belt for about 40 times the height of the trees, the calmest area being at a distance of about eight times the height of the belt.

West Boundary

The high shelter with an ultimate height of at least 50ft. planted along the west boundary of the western farm building enclosure (B) will be effective to a distance of about six chains, which will embrace the homestead enclosure and protect the house. At that distance there is no danger of windfall or overshadowing, even should the trees in the high shelter attain 100ft. (See Fig. 3.)

South Boundary

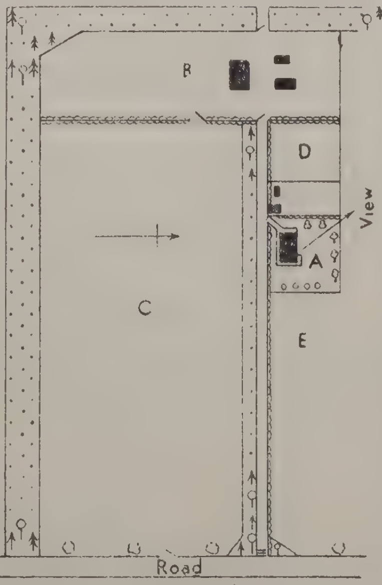
On the southern boundary similar shelter is required for paddock B, for the homestead, and for the protection of a home paddock (C) parallel to the dwelling. As this is the direction from which cold winter winds blow, a long view determines this belt as a suitable site for a wide shelter plantation of tall trees in which farm timber may be grown to advantage. It could contain many tree rows for timber production, but for the present scheme the belt is limited to three rows.

Driveway as Shelter

The homestead is midway between the entrance from the main road and the farm buildings, and on flat land the initial access drive will naturally follow the straightest course, which is likely to be adopted for the official homestead approach road. As its position coincides with the direction for a further necessary shelter belt to serve paddocks D and E, it is possible in this instance to use the driveway for shelter and subdivision. This development involves the erection of a new fenceline cutting off a roadway strip from the home paddock and using the original homestead enclosure fence as part of the farm road boundary. By planting one row of high-shelter avenue trees along the southern road edge, forming a second east-and-west windbreak, a zone of shelter is obtained over paddock E and greater protection is given to the dwelling enclosure. Further possible developments are illustrated in Plans 3 and 5.

Choice of Species

Having decided in the working plan where homestead shelter is required, the next decision is the species to be planted. As the area is unsuitable for the satisfactory growth of Lawson's cypress (*Chamaecyparis Lawsoniana*) other species must be chosen for both hedges and high shelter. This farm is not in a coastal area, so it is unnecessary to use boxthorn (*Lycium horridum*), which, though thoroughly effective, entails heavy maintenance work and for inland localities may well be replaced by a species of which the upkeep is easier.



Plan 3 (scheme A)—Final planting.

In general, if conditions are uniform, the choice of one or two species as standard for all the shelter belts on a farm is a good plan, as it simplifies maintenance and replacement and gives a finished, systematic appearance to a holding, but in homestead planting latitude in the use of species allows a desirable variation.

The narrow belt along the western, exposed border would consist of *Cupressus macrocarpa* on the outside line planted at 9ft. intervals, and an inner line at a distance of 8ft. planted with 9ft. between trees and alternating with the first line. The inner species could be a eucalypt, producing a timber of value for farm purposes—for example, *E. Eugenioides*, the timber of which is durable in the ground and when mature can be used for general farm purposes or for power poles; it is tall growing and from that point of view suitable as part of a breakwind. In different localities other species of eucalyptus would be chosen according to their suitability to the soil and climate. Alternatively, the inner row of this shelter belt might be planted with deciduous species suitable to the locality, such as sycamore or plane, English ash or oak, Lombardy poplar or black poplar, or a mixture of these with certain coniferous evergreen trees such as deodar (*Cedrus deodara*), Japanese cedar (*Cryptomeria japonica*), or Californian big tree or Wellingtonia (*Sequoia gigantea*).

If it is of three rows, the farm plantation belt along the southern boundary may be regarded as two-thirds for shelter and the remainder for timber growing. On the exposed aspect plant *Pinus radiata* (*insignis*), which is hardy and rapidly maturing; then the eucalyptus line, which can be grown within the shelter of the pines and will eventually overtop them; and on the inner border *Cupressus macrocarpa* to provide the basal shelter from draught as, if protected by fencing placed at a distance which eventually just allows of the tips being cropped off by stock, it will remain furnished to the ground along the inner fenced exposure. If *C. macrocarpa*, or a similar tree with persistent lower branches, is not used in this position, it would be necessary to plant a hedge along each plantation border to supply low draught shelter, as the timber trees and pines tend to produce open, clean boles.

The entrance driveway gives wide scope for personal preference in trees, bounded only by the necessity that they should be reasonably tall growing, have spreading crowns, and be able to flourish satisfactorily on the poorish soil of the area. A mixture of deciduous and coniferous species, with the evergreen trees irregularly

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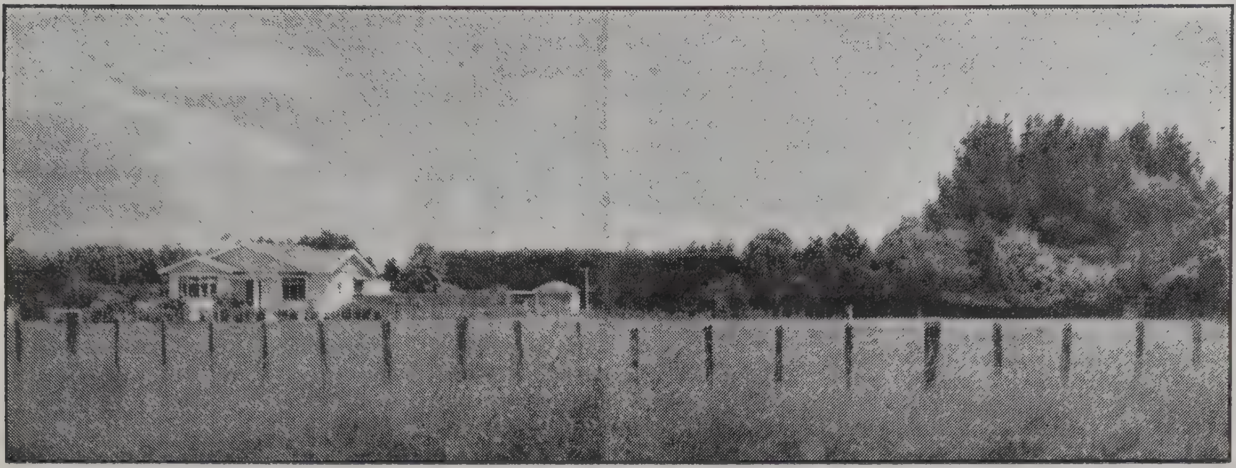


Fig. 1—Well-planned homestead shelter.

spaced along the belt, could consist of specimen trees of the Californian big tree, deodar, cedar, *Cupressus sempervirens* or *C. torulosa*, monkey puzzle (*Araucaria imbricata*), and Nordmann's silver fir (*Abies Nordmanniana*), with deciduous species such as Oriental plane (*Platanus orientalis*), sycamore (*Acer pseudo-platanus*), oak (*Quercus robur*), lime (*Tilia Europea*), Lombardy poplar (*P. fastigiata*), aspen (*P.tremuloides*), and black poplar (*P. nigra*), false acacia (*Robinia pseudacacia*), and smaller trees such as silver birch (*Betula pubescens*), rowan (*Pyrus aucuparia*), or native species—puriri, kamahi, totara, titoki, or silver beech. These trees should be not less than 12ft. apart, thus requiring about 30 trees to plant the driveway.

Hedge Shelter

The position of the main source of high shelter for the homestead block being fixed, the next consideration is for more immediate internal hedge shelter, the most urgent being that around the house and garden. For the immediate protection of the garden and to shelter the back door, yard, and clothesline, as well as providing a feeling of privacy, hedges which will grow rapidly to a fair height—say 8 to 12ft.—are required on at least three sides of the enclosure. The choice of species is wide, according to soil and locality, but, though personal preference might favour an ornamental hedge, a species which requires the minimum of trimming to form a compact barricade should be the main consideration. If in the early stages double fencing to protect the plants is not feasible, hedges must be planted inside the house enclosure fence. In spacing the plants from the fence allowance must be made so that they are a safe distance from browsing stock, while at the same time allowing sufficient width for the growth of the hedge. A distance of 4ft. from the fence should be sufficient.

Subsequent Development

So far in making this working plan it has not been necessary to differentiate between the small enclosure and the larger, as that has no bearing on the position of high shelter, but at this point it will be advisable to give the details separately according to the development possible under each set of conditions.

SCHEME FOR QUARTER-ACRE ENCLOSURE (Plans 2 and 3)

The most important shelter hedge is that on the west of the house surround, and this must be permanent, grow rapidly to medium height, and remain dense. In the absence of Lawson's cypress, which would form an excellent hedge in this situation, a similar hedge would be produced by *Cupressus macrocarpa*, or possibly *Cupressus Benthamii*, which has a slightly quicker growth in such a situation. Both these species will need annual lateral trimming to about 8ft. and topping when the required height is reached. Other possible species for this section would be *Eleagnus japonicus*, which will not grow excessively high without tall trees to support it, or, better, the native species *Pittosporum crassifolium*, or karo, which, grown in a close line, will form a breakwind requiring a minimum of lateral trimming and can eventually be allowed to grow on as a single line of trees as a background for the shrubbery to be planted in front of it. (See Fig. 5.)

Further protection is required on the southern key position of the house enclosure, and, assuming that suggested improvements will be carried out within a reasonable period, the hedge planted here may be temporary, as inside shelter will be provided eventually by a grove of native species planted by the side of the house. The quickest-growing species would be tree lucerne (*Cytisus proliferus*), which grows to 8ft. in two to three years; it requires continual light trimming almost from the start of growth to form a dense base for the hedge, but the operation is light and easy and topping is not necessary because this species never grows much beyond 15ft. A slower but more ornamental hedge for this section would be *Abelia florabunda*, a species of similar habit but more permanent nature. Later, to complete this border of the main driveway on the portions bounding the paddocks to the entrance, a permanent species such as barberry, preferably the seedless variety, should be chosen, or alternatively *Acacia verticillata*, which is of quicker growth and forms an almost stock-proof fence when trimmed.

Further planting of shelter hedges will be required later in developments for orchard, drive, and other amenities. In Plan 3 space is provided within the house enclosure for a vegetable garden, lawn, and small fruits along the east border, with a few low shrubs toward the northern end of the original shelter hedge to the west. This serves to break the hard line of hedge and forms a pleasant border to the view from the lawn in front of the house.

Orchard Shelter

A position for the house orchard is possible on the extreme northern boundary of the enclosure, where per-

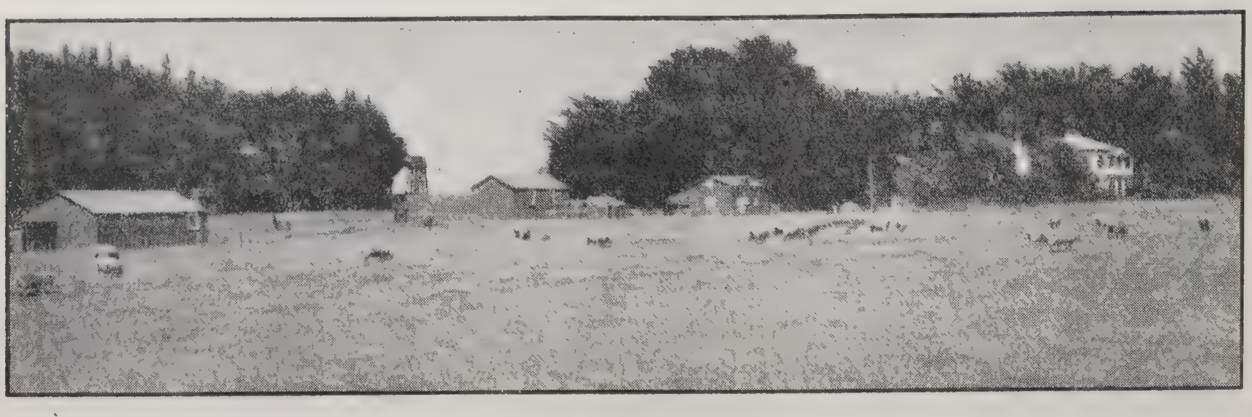


Fig. 2—High shelter should be planted where it will benefit both dwelling and farm buildings.

haps half a dozen trees may be planted in the early stages. They will benefit from the shelter of the house from winter winds, but require some protection from seasonal spring winds from the north. A hedge is therefore necessary along this border, but it should be as low as possible for this purpose, especially at the western corner, which is the viewpoint for the house. It may be of a short-lived species, as in a few years an extension of the orchard may be desired in this direction, in which case a new permanent shelter hedge will be put in further to the north to protect the new fruit trees; alternatively, this orchard extension may be carried out in the same way by cutting off a section of paddock D. In both cases this requires a new start on less sheltered areas.

Suitable species to use here are Chinese privet (*Ligustrum sinensis*), which remains satisfactorily dense when fully grown and requires only one lateral trimming each year; a native such as *Pittosporum tenuifolium* or *tarata* (*P. eugenioides*); *Escallonia rubra*, a quick-growing, red-flowered variety forming a dense hedge up to 15ft.; or the Holm oak (*Quercus ilex*), a slower grower but more permanent for the final enclosure.

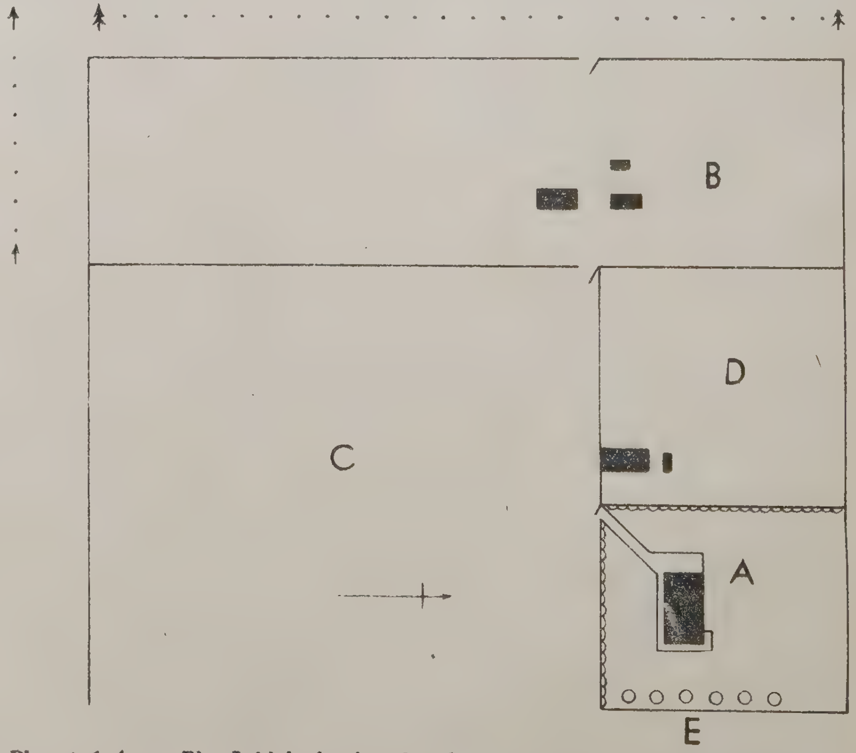
Driveway Additions

With the simpler layout in Plan 3 expansion or reconstruction is not possible on the southern border of the dwelling without moving the line of the driveway and destroying the original enclosure hedge along this side. So the roadway must continue permanently in an almost straight line on its original course, and special care must be taken with the selection of the borderline of mixed shelter trees, as given under species for high shelter, to produce a satisfactory vista from the entrance and to detract from the straight line effect when the homestead is viewed from the road. That may be effected by the addition of a group of low trees planted along the south border of the house; as this is a shaded position it must be devoted to shrubs, possibly of native species, with heights so graded from the garden level back toward the enclosure hedge that the taller ones appear to merge into the shelter line on the opposite side of the drive. (See Fig. 4.)

Further embellishments to the line of the entrance are produced by planting shade trees, such as sycamores or oaks, at intervals along the roadside border of the paddock and by fencing off a small triangle on either side of the gate, in which one or two trees of the avenue species and kowhai are planted to form a small clump flanking the entrance.

Paddock Hedges

While the permanent high shelter is growing along the western boundary local protection must be provided for the home paddocks C and D, and here a stock-proof hedge should be planted running south to north at right angles to the driveway. This hedge may be allowed to maintain a greater height than those around the garden to increase the zone of shelter influence in the small paddocks. Suitable species for these portions are barberry, preferably the seedless variety, or prickly wattle (*Acacia verticillata*), both of which require annual trimming to maintain a solid base protection.



Plan 4 (scheme B)—Initial planting (see key to shelter species on page 587).

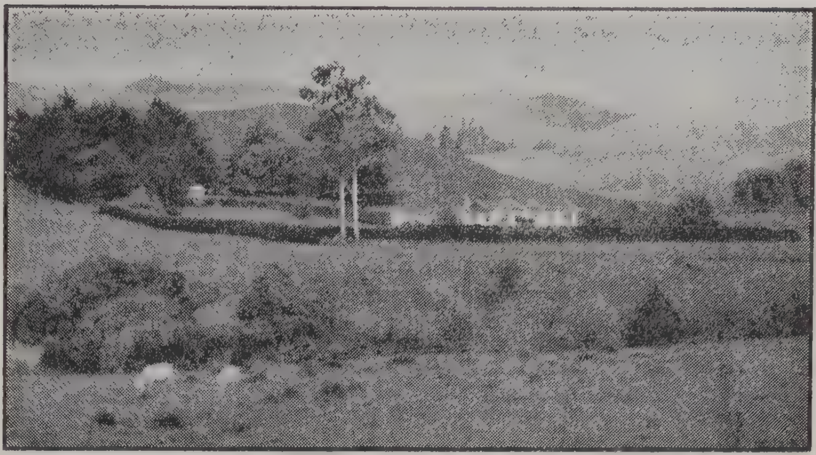


Fig 3—Shelter pines planted at a safe distance from the house.

Similarly, from the yard gate to the garage requires a length of permanent and rapidly-growing hedge of sufficient height to act as a windbreak to paddock D while the high shelter of the avenue is growing up, but not of such height or density as to shade that portion of the driveway which it ultimately adjoins. Barberry or prickly wattle are also suitable here, and a second temporary fencing to protect young plants from browsing, especially by sheep, is desirable with either species for the first few years.

SCHEME FOR HALF-ACRE ENCLOSURE (Plans 4 and 5)

The initial hedges around the house enclosure are the same as for the smaller scheme, but as more space is provided around the house and in the environs, more scope is offered for beautification and developments such as improvement of the approach, ornamental planting, and formation of shrubberies, all of which increase shelter given to the homestead.

Loop Driveway

Building on to the original layout as shown in Plan 4, the main development is the provision of a "turn-round" loop in the drive circling the house (Plan 5). In this expansion the original shelter hedges are used as much as possible, but the new arrangement entails further planting of tree borders and shrubberies. As well as its value for utility, a curve introduced into the homestead landscape breaks the angular effect and gives a more spacious and opulent appearance to the farm as viewed on approach from the highway. (See Fig. 6.)

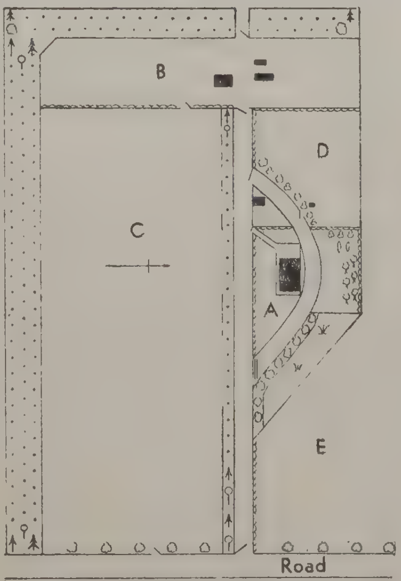
Starting at the entrance gate, the barberry or prickly acacia hedge boundary on the north supplies ground shelter for stock in paddock E, also protected by the high shelter line of avenue trees, and gives a finished appearance to the entrance without causing a wet driveway by cutting off the sun.

The curved border of the turn off where it carries on from this hedge toward the house must eventually be double fenced, and it should be planted with trees of medium height, decreasing to small trees and low shrubs where it reaches the lawn at the front of the house. The species used to border the "turn-round" should be mainly deciduous and ornamental with occasional evergreens, and may consist of a mixture of silver birch, varieties of formal cypresses, evergreen oak, English oak, mountain ash, yew, Australian myrtles (*Acmena* spp.), such natives as puriri, kowhai, and true ake ake (*Dodoaea viscosa*).

Planting of the north-western border of the loop is required partly for shelter and partly as embellishment to the driveway as seen from the house. As it approaches the house closely, the use of tall trees might cause danger from windfall and would in any case be out of place, so here also species should be chosen from small-growing, light-crowned, or deciduous trees of an ornamental type such as silver birch or kowhai, with low bushes interspersed to consolidate the shelter it affords to paddock D. Such a light-foliaged north margin also allows sunshine to penetrate and avoids a wet and shady driveway.

In these borders the smaller trees can be planted closer together than in the main avenue, a spacing of 8ft. or 9ft. being suitable, and it is probable that in time the space will become filled by low-growing shrubs, either planted or by the natural seeding of native species.

Where the drive passes the north front of the house it should be left open to a lawn but linked by low, widely-scattered bushes to the line of trees bordering the drive in either direction. The viewpoint from the house is to the north-west, and therefore this low group should extend toward the shelter hedge in graduated height, arranged to supplement the view which will be partially framed by suitably-placed deciduous trees such as silver birch or flowering cherries, flanked by one or two well-furnished specimen conifers planted on the edge of the orchard to give some added shelter from north-westerly spring winds. In the formation of these shrubberies the owner or his wife will find plenty of scope for individual tastes.



Plan 5 (scheme B)—Final planting (see key to shelter species on page 587).

Native Shrubbery

Between the house and the main back driveway lies an area somewhat too shaded by the house for vegetable growth but most suitable for a grove of native species, which acts as shelter and, viewed from the road, forms a low, green background to the house, backed by the tall, mixed timber trees of the farm driveway behind.

In this native grove the taller and quicker species should be planted toward the hedge, using those which grow up to 30ft.—such as lacebarks, true ake ake, *Phebalium*, *Pittosporum* species (especially tarata), mahoe, pomaderris (tainui), and puriri—and planting within these some of the timber trees whose growth will not reach forest height for many years—totara, the beeches (which form good units in such a grove), miro, karaka, and rimu (which in its young state provides a spreading shelter of striking appearance). In front of these specimens should be planted shrubby native species such as *Nothopanax* (five finger), coprosmas, and olearias, grading down in size to low veronicas and bushy species along the footpath. In this grove opportunity may be taken to use kowhai to introduce vivid colour, and tree ferns

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interspersed in the middle distance emphasise the distinctive, indigenous appearance of this portion of the house surround.

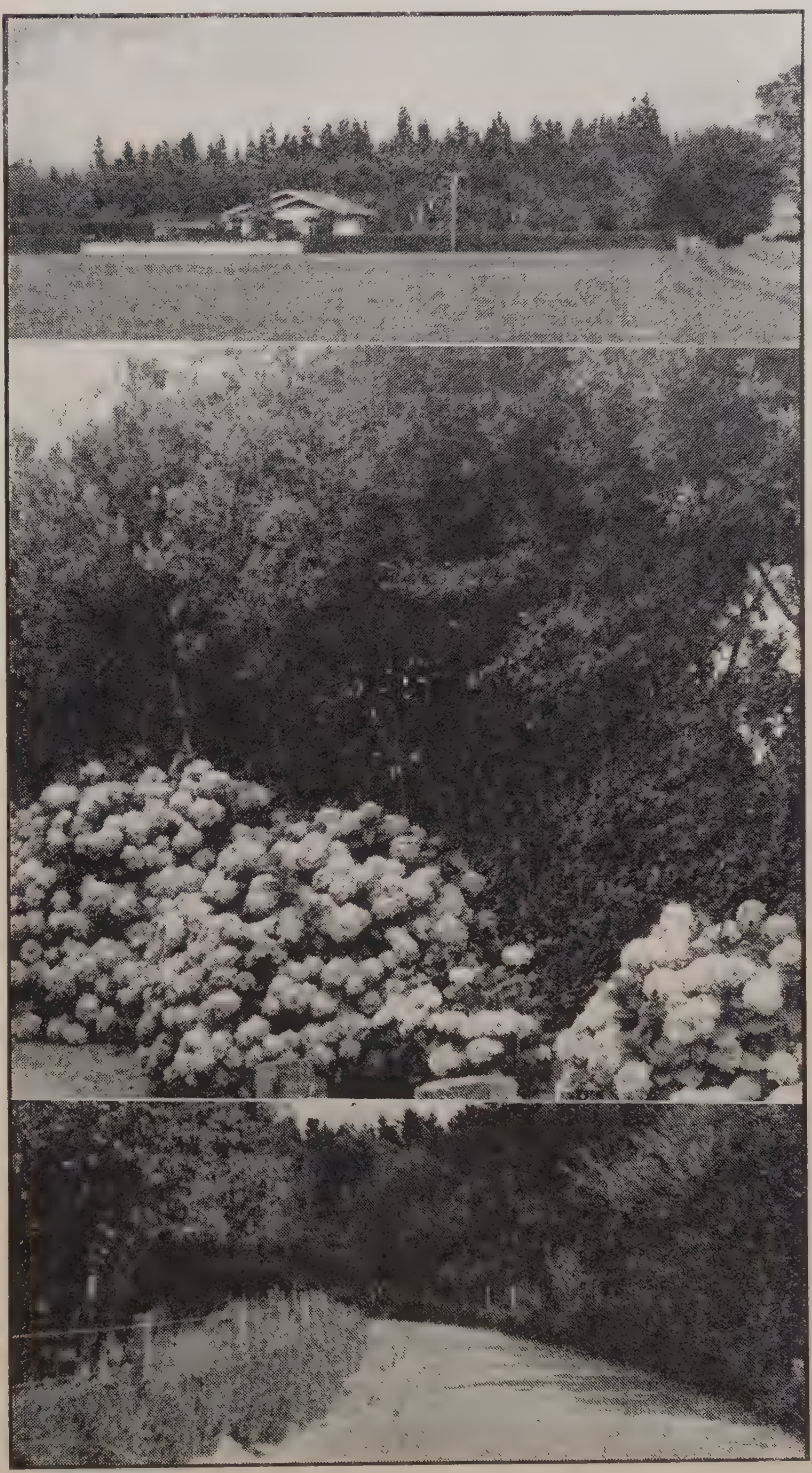
Orchard

In the original enclosure space is provided for a house orchard of about 20 trees on the extreme north and a hedge is planted in the early stages to shelter it. If an extension is required later, more ground can be enclosed on the north and duplicate hedges planted, or alternatively the sheltered area occupied by the pampas grass crop could be used if necessary, leaving a permanent belt of pampas to provide low shelter along the driveway margin.

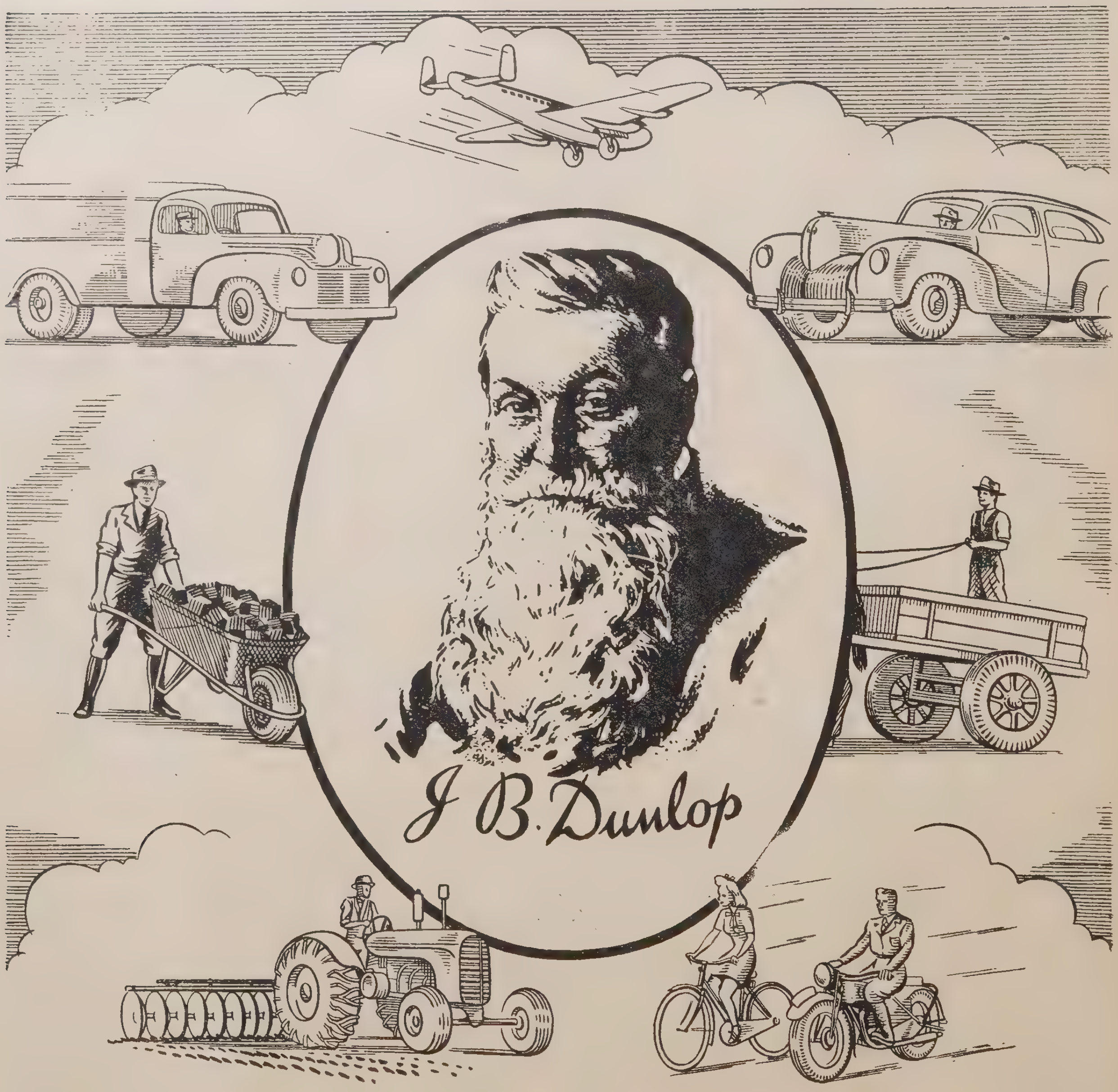
Stages of Development

The working plan having outlined a programme of planting for total shelter around the homestead, the period which will be required to complete operations depends on circumstances, but it is well to make provision for a certain amount of planting each year, which entails forward planning for fencing and the supply of planting stock. In the plan under consideration, assuming that sufficient fencing and labour is available and starting with the first year's work, the following stages should be carried out in order of urgency:—

1. The planting of the shelter hedges on two or more sides of the house enclosure. If time is available and the season suitable to cultivate a strip of land along the fenceline previously, it will be an advantage to have this hedge planted during the first months of occupancy if they are during winter or spring, but, rather than risk losing the plants by late spring planting in a locality of summer drought, it is better to make sure of at least getting the ground prepared before the weather becomes dry and hot. In some seasons lost time may be made up by planting the hedge in late autumn so that plants are established before winter frosts begin. In ordinary circumstances both high shelter and hedges can be planted from June to September.
2. An effort should be made to get planted early at least a portion of the main high shelter belts, especially the portions along the south and west of the buildings and paddock B, as their growth will have the greatest influence on the shelter for the house. It may be necessary to plant the long belts, especially the shelter plantation on the south border, in annual sections, planting each area as the double fencing progresses. If it is impossible to complete all the rows in a section in one year, the windward row is best put in first; in succeeding years the inner rows can be added at



Upper (Fig. 4)—Well-planned shelter showing height gradations in the planted rows. Middle (Fig. 5)—Shelter hedge of "karo" planted round garden. Lower (Fig. 6)—A curved driveway is attractive.



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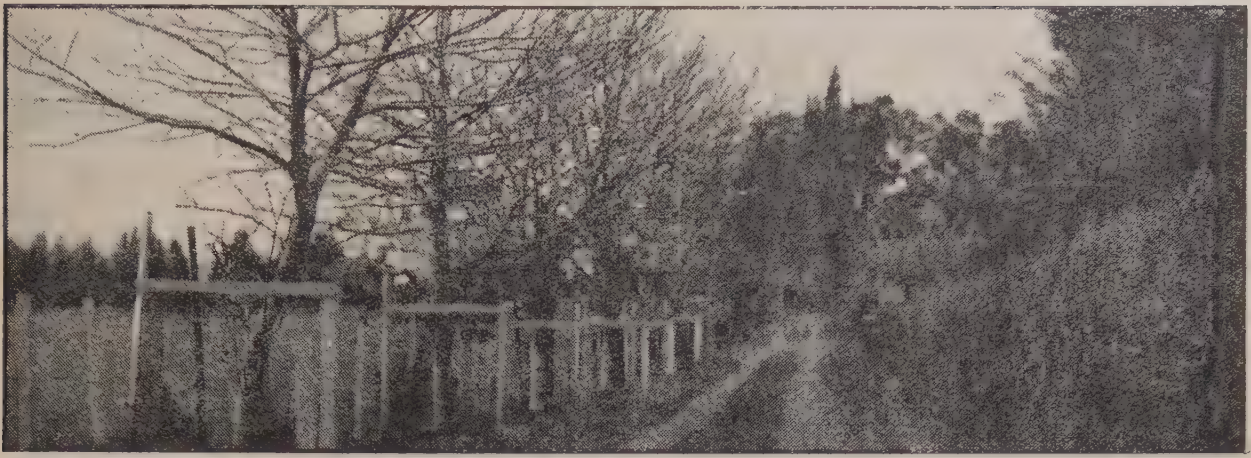


Fig. 7—Protected trees bordering a straight driveway.

leisure, and they will reap some benefit from the early planting.

3. The hedge length from south to north along the west of paddocks C and D is probably the next development necessary, and, if not already in, the hedge on the south of paddock D should next be completed.
4. As soon as material is available the fencing of a driveway should be undertaken (Fig 7). If double fencing is not possible, enclosure from stock must be made on one side and temporary, individual guards built on to this around the specimen trees which will form the high shelter border along the approach drive. That process is troublesome in times of shortage of labour, wire, and timber, but it ensures a year or more of early growth. Two or three strands of barbed wire may be stretched from the fence posts outward and stapled round a stout stake to make a triangle, with sides at a safe distance from the tree to prevent browsing. As supplies increase the south boundary fence of paddocks D and E will be erected, and that will completely fence off the driveway enclosure, in which planting can then proceed as convenient.
5. Meanwhile the planting of the area between the house and the south hedge may be proceeded with as opportunity arises, working toward the house so that the native species may get a little shelter from the hedge growth and provide mutual protection as planting is extended. The orchard trees can be planted at any time provided the land has received a good cultivation; the sooner they are in the sooner will they come into bearing. At the same time the scattered evergreen specimens on the western border of the orchard should be planted so that they may grow up and lend protection to the fruit trees. Like most of the specimen trees, they may require staking for the first few years.
6. The remaining basic portion of the protection plan to be completed is the main farm plantation belt along the south border, which can progress only when the double fencing is completed. All the rows in this belt should preferably be planted together as each length is completed, as the preliminary cultivation encourages weed growth on a strip left unplanted, but this difficulty may be mitigated by growing potatoes for a season on any unused area alongside the planted line of trees.
7. Having completed the initial basic shelter plantings to protect the homestead setting, the further developments provided for in the working scheme may be attended to as opportunity offers, including the changes necessary to form the turn-off on the driveway. As soon as the necessary double fencing strip is completed along the two ends of the projected new drive, a start may be made planting them with deciduous and ornamental trees. The subsidiary shrubs may be added as required to form a low, filling-in, basal screen carrying the line through to the edge of the lawn, which should be left open in front of the house.

The formation of a working plan allows the planter to foretell to

Fig. 8—An ash tree given enough space to develop a characteristic shape.

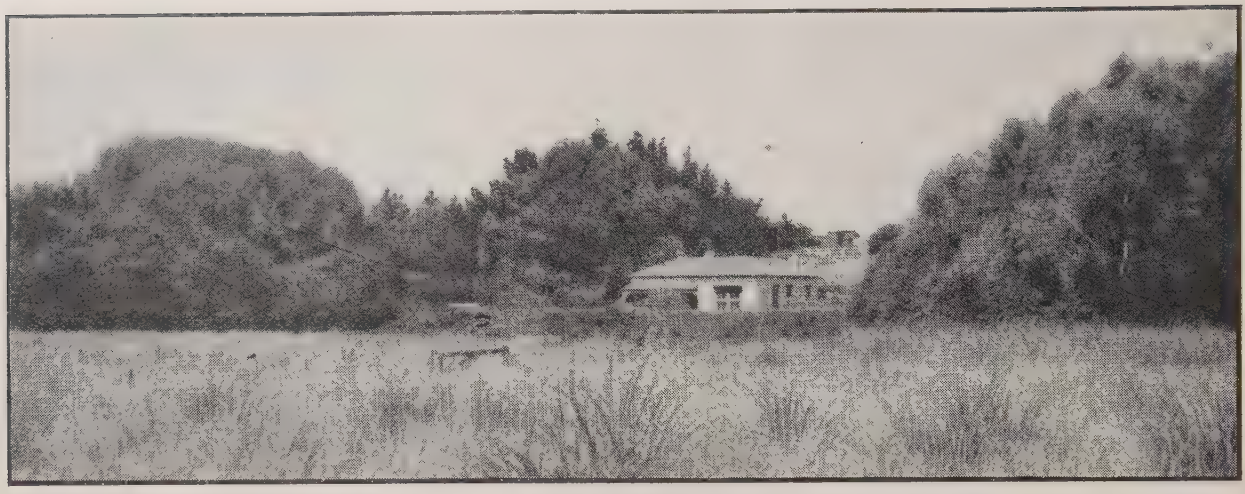


Fig. 9 (above)—View of Taranaki homestead described in text.

some degree the result of his labours and to avoid certain mistakes, notably in the spacing of shelter with regard to buildings. The tendency when first planting is to underestimate the height and size to which individual trees will grow (Fig. 8) and the space immediately around the house which, to avoid overshading or danger from windfall, should not be planted with big trees. In the schemes given the main high shelter belts are placed slightly more than five chains from the house on the south and west, and the tall trees of the avenue drive are more than a chain from the house.

A Taranaki Farm

It is of interest to examine the details of shelter planting on a farm in Taranaki which has been planted according to a scheme somewhat similar to that in the plans described.

The main differences in conditions on the two farms are:

1. On the hypothetical farm described the topography is assumed to be mainly flat, whereas on the Taranaki farm the land west of the homestead rises to a low coastal ridge;
2. A higher rainfall of about 42in., spread evenly over the year, is more favourable to the growth of trees.
3. The soil type is a silt loam and, by the evidence of the growth now existing, the area is favourable to the thrifty growth of Lawson's cypress.

Points of resemblance between the two farms are:

1. The general layout is similar, using both shelter hedges and high shelter belts composed of *Pinus radiata,* eucalyptus species, and *Cupressus macrocarpa.*
2. The entrance drive is used for shelter and some arrangement has been made to provide a turn-round for traffic near the house.
3. The shelter belts have been supplemented by the planting of shrubberies, mainly of native species, in the vicinity of the house.

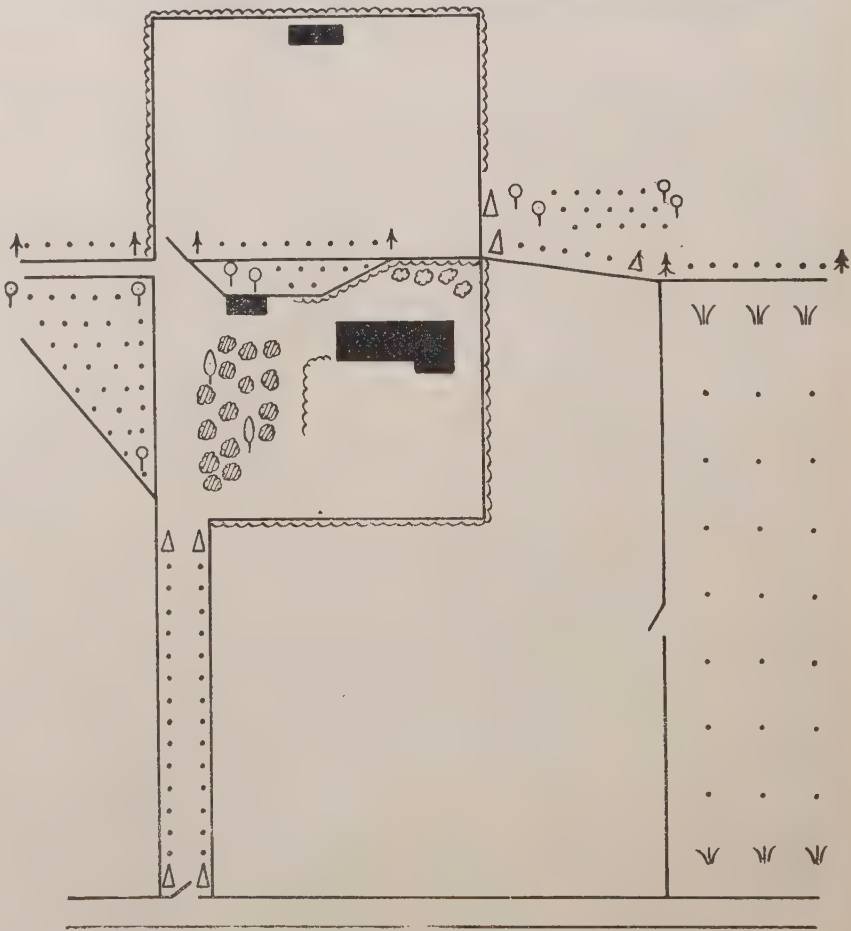


Fig. 6—Layout of shelter on Taranaki farm shown in photograph above.

The homestead block (Fig. 9) includes the house enclosure, bounded on the north and east by low, trimmed hedges, with high shelter planted on the south and west of the homestead and extending to the farm buildings, and composed of belts of *P. radiata* or eucalyptus. These give adequate shelter to the homestead, but in almost every direction the trees are too near to the house. On this farm the original shelter planted was boxthorn hedges only, and it was later amplified by planting *P. radiata* to obtain height so that winds would be carried up and over the enclosure. The eucalyptus clumps were planted merely as an experiment and no thought was given to their ultimate possible height.

The result of these plantings is that on the south the trees have a height of 45ft. to 60ft. in 15 years and, being planted within two chains of the house, they will in time prove a danger. That has been realised and it has been decided to remove this plantation of eucalyptus gradually as opportunity arises for it to be used for farm timber or even firewood. The farmer plans to replant the southernmost boundary with a narrow belt of shelter trees, possibly *Cupressus macrocarpa*.

The *Pinus radiata* on the west of the house are not yet 20 years old, but already they tower above the house (Fig. 11). They are planted about a chain from the back of the house and when mature will be a danger to it. That demonstrates that when used as homestead shelter these pines must be at least two chains from the house.

Some of these trees were planted from stock grown from cuttings taken from the tips of branches of young trees, but no difference can be observed from trees grown in the ordinary way.

On the north side of the homestead a wide eucalyptus belt has grown beyond expectations, and when they are older and of full height and growth these trees also will be found to be too close to the homestead. A line of Lawson's cypress has been used for basal shelter on the north-east margin of these eucalypts, and this has proved a good procedure, as in this position growth will not be too rapid and at the angle at which this boundary is planted the eucalypts will provide sufficient protection from the seasonal northerly winds. Lawson's cypress will not stand salt winds and no attempt has been made to plant it directly in their path, but the best value has been obtained by planting it on an easterly aspect and where it receives shelter from the westerly winds.

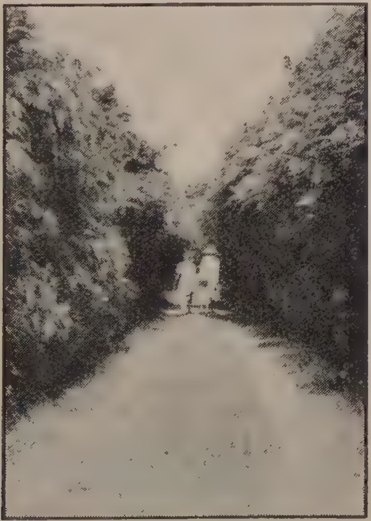


Fig. 10—Lawson's cypress planted as an avenue with only 20ft. between the rows has to be trimmed as a hedge to keep roadway clear.

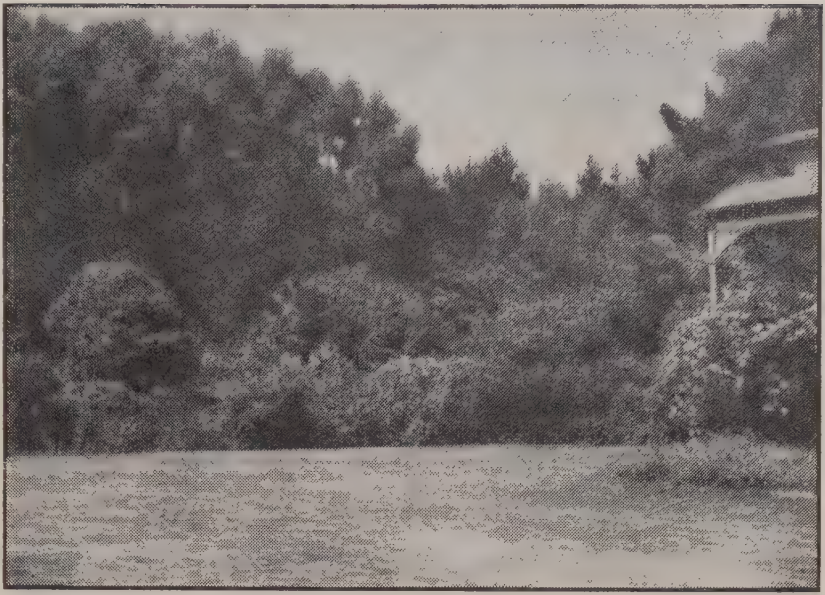


Fig. 11—View of native grove and near shelter of the Taranaki homestead. Eucalyptus trees grow too high to border a driveway close to the house.

Further north from these Lawson's cypress the margin of the plantation has been completed with *Cupressus macrocarpa*, and it probably would have been more satisfactory to have planted Lawson's cypress here also, as on a sheltered east face such as this the macrocarpa has a greater tendency to produce long, heavy branches which overshade the paddock and cause a loss of pasture growth.

The drive is lined with two single rows of Lawson's cypress planted 5ft. apart with 20ft. between the rows, the intention being to make a driveway lined with a row of single trees, each allowed to grow in its natural shape without topping or trimming. In 12 years, however, the branches threatened to meet across the driveway and it was necessary to trim each tree on the inside. Since then the trees in each row have closed up their branches and now form a solid hedge on either side of the drive, and periodically it is necessary to trim them to allow the passage of traffic (Fig. 10).

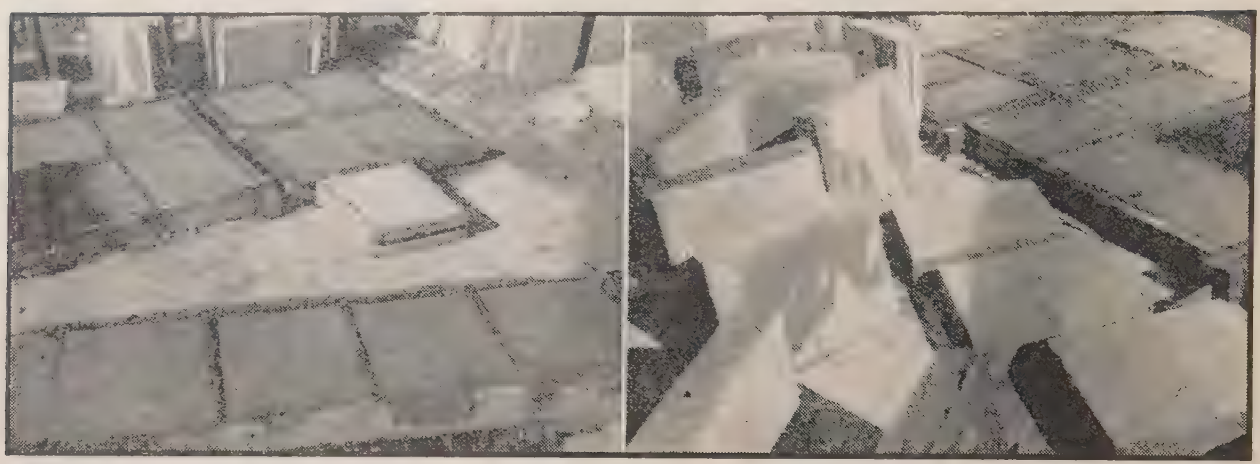
The lesson to be learnt from this driveway is that to form an avenue lined with single trees of Lawson's cypress in their natural habit at least 40ft. must be left between the rows and 15ft. between trees.

An extension of the driveway was formed along the side of the house to the garage at the back, but the complete turning loop was not finished and only a gravelled space for backing the car was provided. However, the area enclosed by the projected loop was planted with the intention of making a native shrubbery at the side of the house, and in this are growing trees of native species now more than 20ft. high. They provide excellent additional shelter from south winds but here again the trees are too near the house and, though they do not rob it of sunlight, they give a hemmed-in effect and in summer tend to prevent cool air circulating freely around the house.

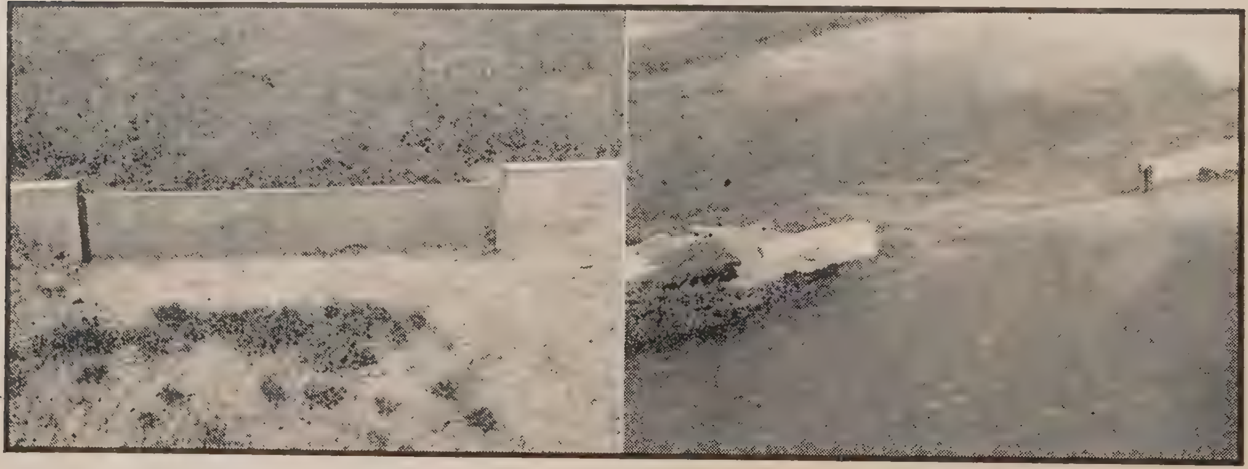
There is no room for a turning loop circling the house, but a satisfactory turn could be made by completing the loop around the native shrubbery and sacrificing part of the lawn on the south of the house and the hedge which borders it.

The owner of this farm plans improvements in the shelter growing around the homestead, and because he now can see the results of his former faulty planting he is a strong advocate of planning shelter on the basis of the rate of growth of the species he wishes to use.

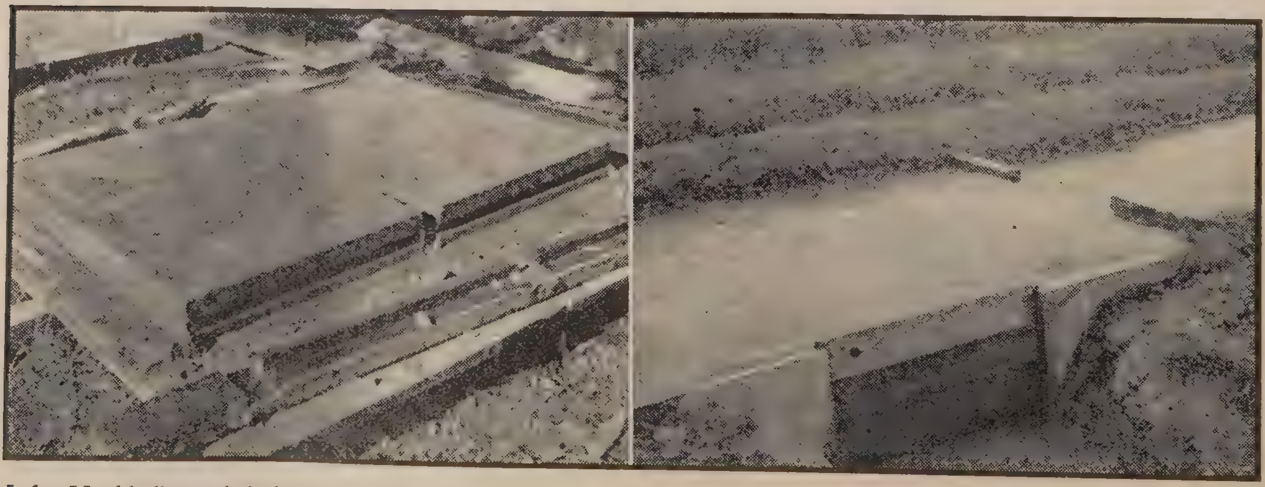
CONCRETE IRRIGATION HEAD-GATES MADE ON THE FARM



Left—Moulds filled with concrete. Right—Concrete blocks ready for installing.



Left.—Completed head-gate in position. Right—Irrigation water flowing through head-gate on to pasture.



Left—Mould dismantled showing the larger concrete blocks for installation at junction of head-race. Right—Blocks at junction of head-race.

Concrete Irrigation Head-gates Made on the Farm

By W. A. McKELLAR, *Fields Instructor, Ashburton.*

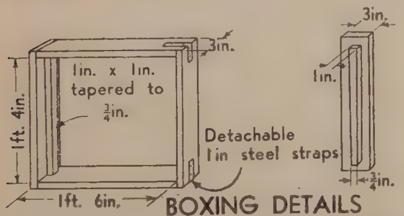
WITH the steady increase of areas laid down for irrigation under the border dike system in the Ashburton County of Canterbury, there is a demand for a cheap and effective type of head-gate to control the flooding of the land. This article describes how a farmer may save initial expense and maintenance costs by making concrete head-gates on the property.

HEAD-GATES made of well-seasoned heart timber, where that was available, have proved as costly as those made of concrete and less durable. Concrete head-gates have proved eminently suitable for the job, and once installed in the bank of the head-race are permanent. At first the head-gates were precast and carted to the farm. Because of the excessive handling the concrete had to be reinforced, and by the time the head-gate was installed in the field the cost was very high.

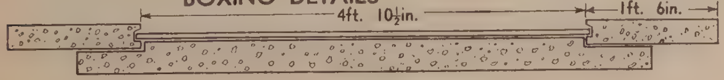
To reduce the cost of these head-gates several farmers began making their own in simply-constructed wooden moulds. Most of these moulds have been made from a plan drawn by the Public Works Department. The farmer is able to make use of his labour to make these concrete blocks under cover in winter or when conditions are unsuitable for other work on the farm. Failing that, a large number of head-gate blocks can be made with only a few moulds by pouring the concrete first thing in the morning, taking the moulds off next day, and pouring a further number.

A suitable type of mould measuring 18in. x 16in. x 3in. can be made of dressed 3in. x 2in. or 3in. x 1in. rimu. If it is brushed with old engine oil, the concrete will not stick to it. On one 16in. side a piece of dressed 1in. x 1in. rimu is tacked so that the head-gate board may slide in this slot in the concrete block. The mould must lie on a level surface—for example, a concrete floor or a wooden mixing board. If a sheet of newspaper is placed in the bottom of the mould, the concrete will not stick to the underneath surface. Several single- or double-block moulds have been found easier to keep level than a composite mould to make 8 or a dozen blocks at a time.

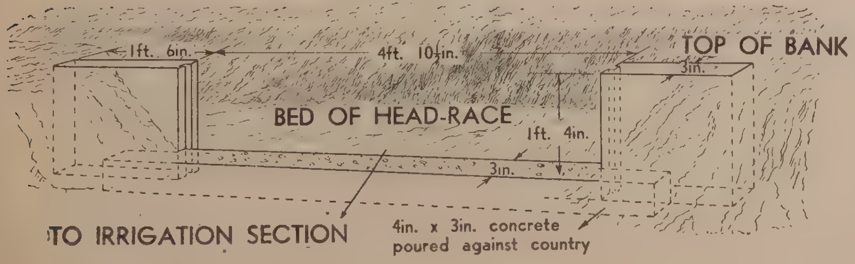
As no reinforcing is used in the blocks a fairly strong mix of concrete is necessary, a 5 to 1 mix being found quite suitable. The shingle should not have too many big stones in it, as they tend to leave a poor surface on the concrete and cause cracking of the blocks. The concrete should not be too thin, as it will take longer to set, or too thick, as it will not pack well into the corners of the mould. The mould can be taken off in about a day, though that will vary with the time of the year. The green concrete should then be allowed to mature for a few weeks to avoid damage when it is being carted out and installed in the field.



BOXING DETAILS



PLAN VIEW



QUANTITIES

Shingle: 1 yard shingle makes about 10 complete head-gates.

Cement: 5 bags to 1 yard of shingle (strength 1 of cement to 6 of shingle).

Where the head-gates have not been installed in the autumn they should be put in by late winter or early spring to allow the soil to consolidate well before irrigation is begun in the early summer. Where consolidation has not taken place the irrigation water tends to scour round the concrete blocks and wash the whole structure out.

The 18in. x 16in. x 3in. blocks are placed in position in the banks and a 5ft. x 1ft. x 1in. stop-board inserted in the slots of the head-gate. A 4in. x 3in. sill of concrete is then poured so that the top surface is level with the ground and the side nearer the head-race is flush with the stop-board to prevent water escaping between the concrete sill and the stop-board. After allowing a few days for the concrete to set hard the structure should be back-filled and the soil rammed well. A little grass seed scattered over the bare soil will provide a good cover and prevent scouring or baring of the concrete, especially by lambs, which do much damage running up and down the banks. *Pinus radiata* timber has proved quite suitable and economical for stop-boards.

The use of larger blocks at junctions in the supply races in the internal farm reticulation is also recommended. The placing of these at suitable points in the race system does away with many canvas dams which are both costly and perishable. Adjustable stop-boards prevent the water from entering the side head-race. Where an internal farm race system is adequately fitted with these diversions it will be found that much expenditure of time and labour is avoided, as the use of canvas dams is reduced to a minimum.

These gates have to be more substantial to withstand the pressure from a large body of water. The concrete blocks are made 36in. x 24in. x 4in. with a 1in. slot to hold the stop-boards. The blocks are set 3½ft. apart. A concrete sill 3in. wide by 6in. deep is poured, similar to the one for the small head-gates; it is advisable to place some concrete on either side of each block to prevent scouring round the structure. Only one set of stop-boards is required, as only one gate is closed at a time, and as long as both gates of the pair have the same width of opening the boards are interchangeable. Here also *Pinus radiata* has proved quite suitable for the job.

The convenience of these head-gates combined with their saving in time and labour will more than repay their cost, and they add to the farm an asset which is permanent and useful.

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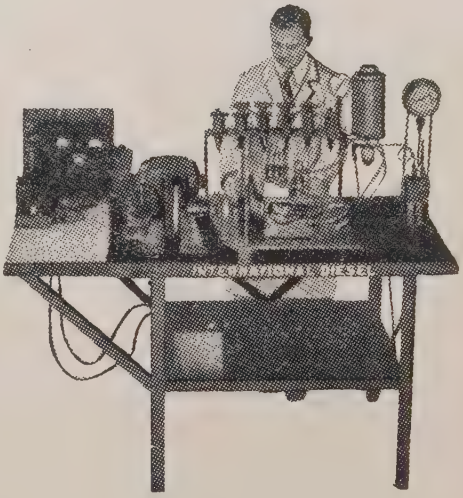

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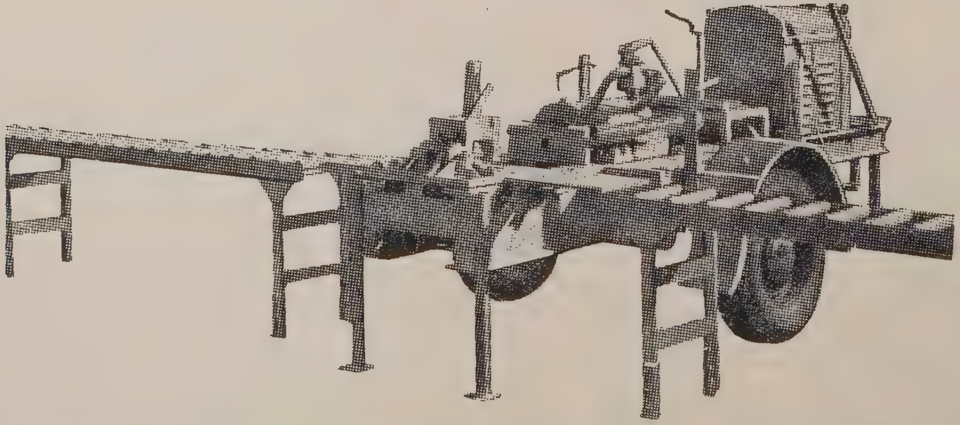

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ESTABLISHING A HOME ORCHARD

By R. G. HAMILTON, *Horticultural Superintendent, Auckland.*

A GREAT deal of pleasure as well as profit can be derived from a well-tended home orchard. Most householders have the urge to plant and maintain a few fruit trees around their homes, but, unfortunately, healthy, well-kept trees appear to be the exception rather than the rule in the home garden. The question might well be asked: "Is the average householder indifferent to the condition of his fruit trees, or does he lack the knowledge to keep them in good condition?" In the former instance he would be well advised to remove his practically-useless trees, for not only would the appearance of the garden be improved but a service would be done to tree lovers by removing sources of disease. For the householder who lacks knowledge of fruit tree culture this article details steps to be taken to establish a home orchard. Further articles will deal with general maintenance and disease control.

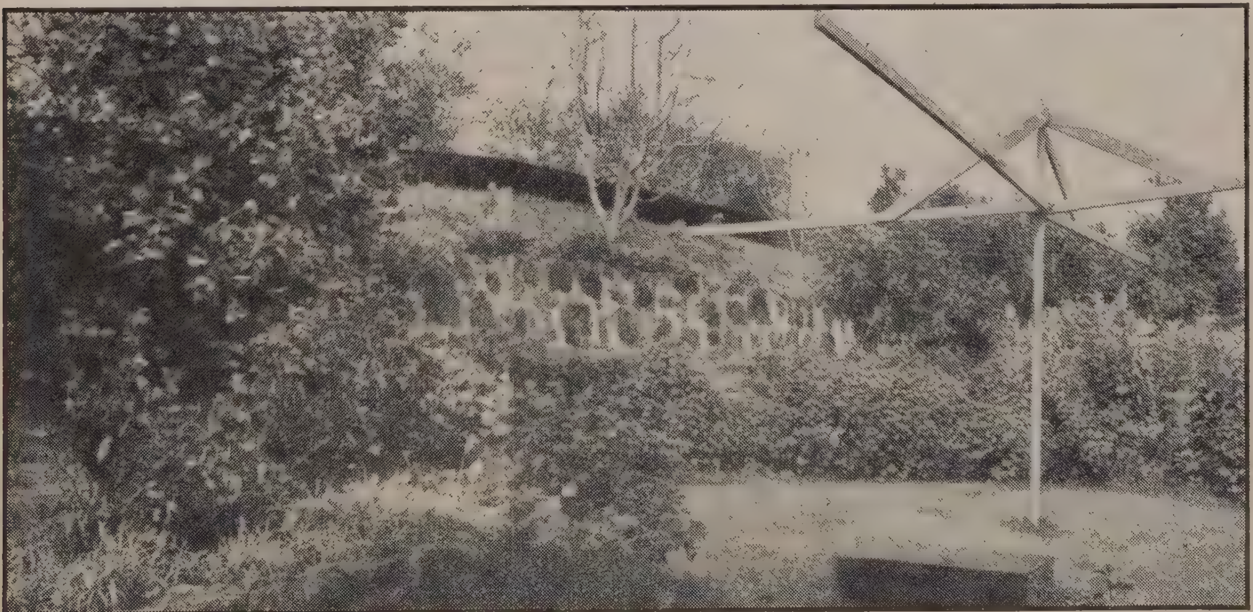
Citrus trees, because of their evergreen nature, make excellent shrubs for the front lawn.

WHEN planning a home orchard consideration should be given to the site, shelter and drainage, the kinds and numbers of trees, and the varieties to plant.

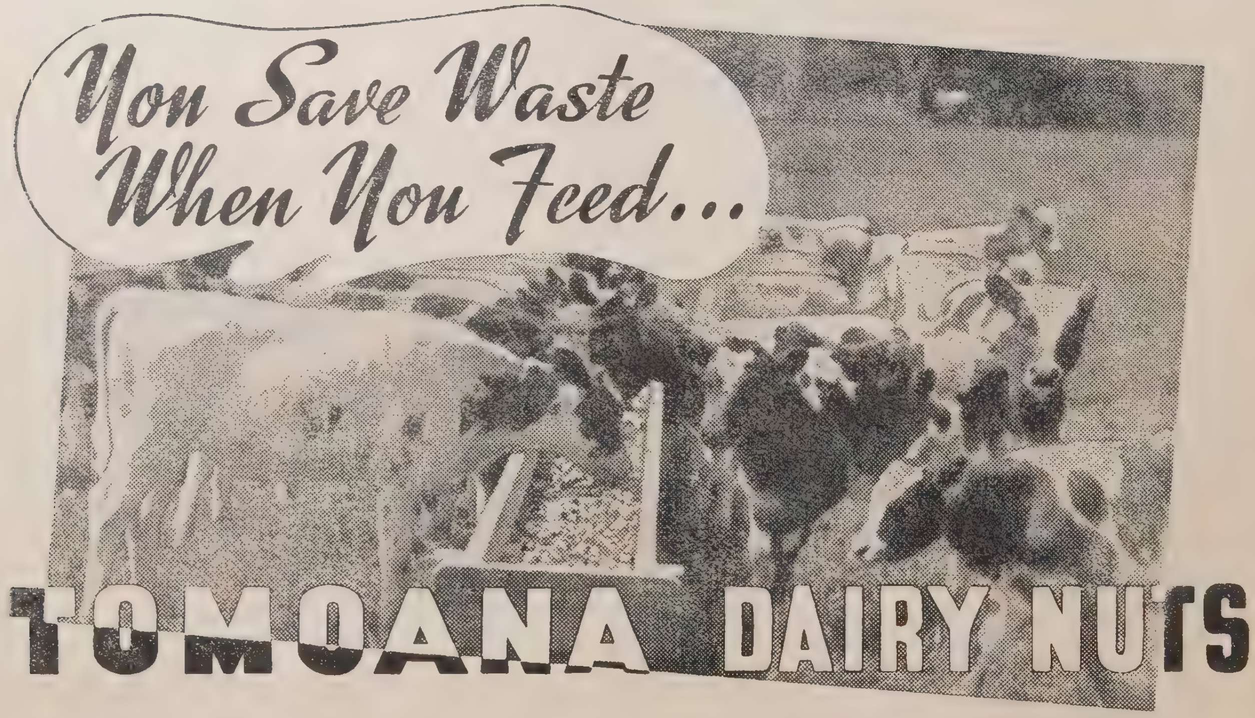
Choice of Site

The average person has little choice of site for his home orchard because of the limited area available, but at times it is possible, especially on farms, to take advantage of the most suitable portion of the area. Orchards on far too many farms are planted in positions other than the most suitable and with the trees crowded close together. That is excusable to some extent in towns, where the available room is often extremely limited, but the farmer usually has greater choice of position for his orchard and more room at his disposal.

Flat to gently-sloping land with a northerly aspect is the most suitable, both for ease of cultivation and to secure the full benefits



A well-laid-out back garden with citrus trees in left and right foreground and apple trees along the embankment at the back.



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Well-spaced trees in a home orchard.

of warmth. A good depth of fertile soil overlying a free, well-drained subsoil is desirable. Heavy clay soils are most unsuitable, and if there is no other choice of site for a home orchard, green crops should be grown and regularly turned into the soil to improve fertility, aeration, and mechanical condition.

Stone and citrus fruits do best on light, friable soils overlying a well-drained and friable subsoil.

Apples do well on fairly heavy soils overlying clayish subsoils free of excess water.

Pears and quinces will succeed in even heavier soils containing more moisture than stone fruit or even apples will tolerate, but even for these fruits the drainage must be sufficient to avoid waterlogged soil.

Berry fruits, such as raspberries and currants, prefer rich, deep loams free of excess moisture but reasonably moist during the summer.

Gooseberries and strawberries do quite well on a wide variety of soil types.

Passion fruit and tree tomatoes require a cool, moist root run in summer months, but will not thrive in heavy, wet soils.

Shelter and Drainage

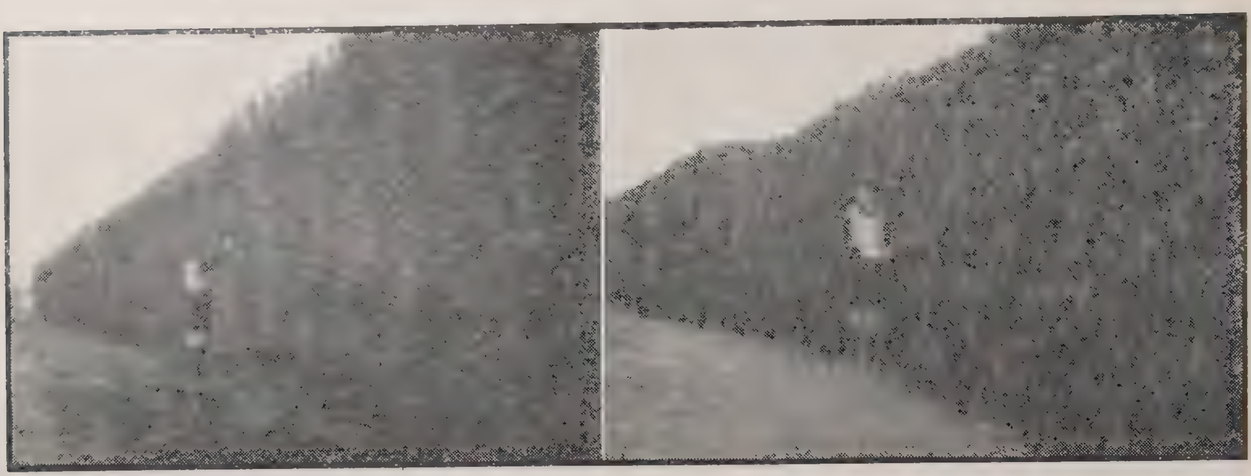
The site should be sheltered from both prevailing and cold winds. The leaves are the food-manufacturing organs of the tree, and it is vital that their efficiency be not impaired by wind or other damage. Excessive shelter should be avoided, however, as over-protection tends to promote favourable conditions for the increase of pests and diseases. Shelter should not prevent the fruit trees securing the full benefits of sunshine; sunlight is necessary in promoting the full colour and flavour of fruits and in maturing the new season's growth.

A city or suburban orchard seldom needs very high shelter, as adjacent houses and hedges serve to break the full force of winds. A 6 to 8ft. hedge on the windy sides should prove adequate in most circumstances. Suitable hedges may be provided by *Escallonia exoniensis* (white flower), *Pittosporum eugenoides* (the golden matipo), *Ligustrum japonicum* (small-leafed privet), *Olearia Fosterii* (golden ake ake—very suitable for the colder climates), or *Abelia florabunda.* For the warmer, more or less frost-free areas *Tecoma capensis* is an excellent quick-growing hedge.

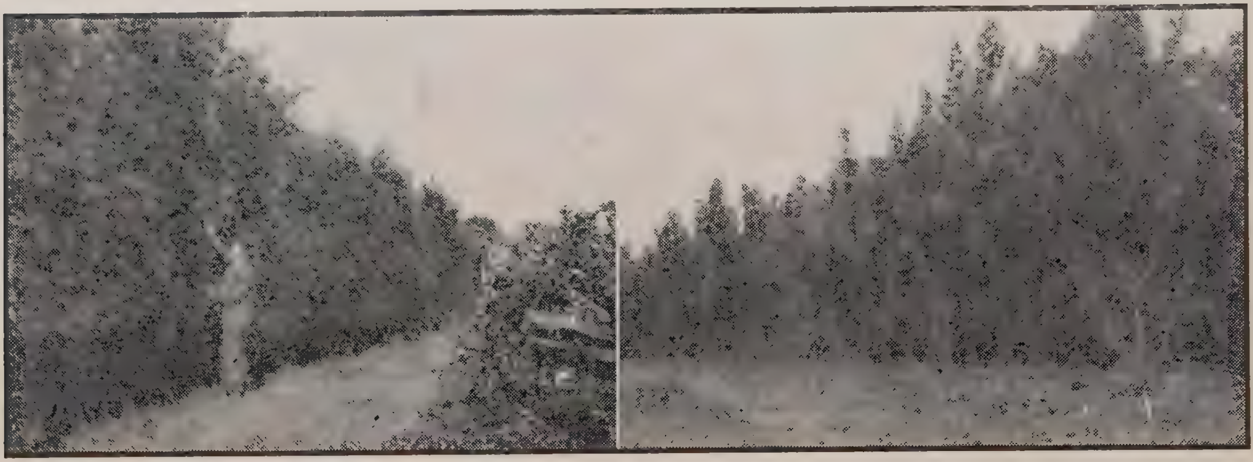
On the farm orchard, however, more extensive shelter is usually necessary. On the cold and windy sides a satisfactory shelter of up to 20ft. can be provided by *Cupressus lawsoniana* (not suitable for wet soils), *Cupressus Benthamii,* or *Cryptomeria japonica,* all of which, as well as being very attractive, provide satisfactory shelter to ground level. The giant bamboo (*Bambusa vulgaris*) also provides excellent high shelter and does not sucker like many of the bamboos. The Lombardy poplar as generally grown is too high for the farm orchard, but if planted only 2ft. apart, and kept trimmed and topped, will provide quite good shelter. *Pinus radiata* or *Cupressus macrocarpa* (untrimmed) are generally too tall-growing for the home orchard, and they tend to lose their lower branches and so cause cold draughts through the

Part of a feijoa hedge (variety choiceana) planted 4 years.

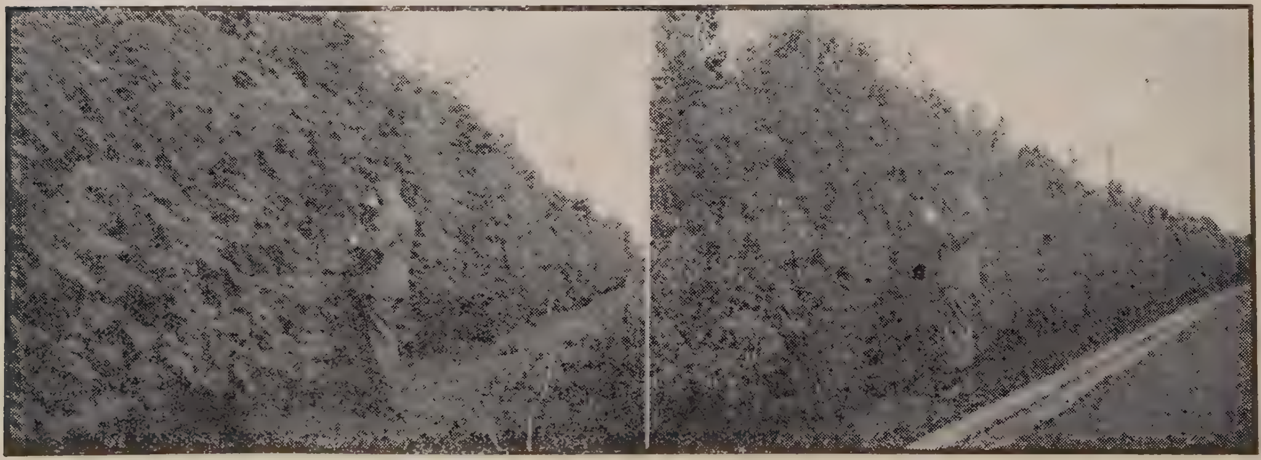
SUITABLE HEDGE SPECIES FOR ORCHARD SHELTER



Left—*Escallonia exoniensis* planted 6 years. Right—*Tecoma capensis* planted 6 years.



Left—*Cupressus Benthamii* planted 6 years. Right—*Bambusa vulgaris* planted 6 years.



Left—*Albizzia lopantha* planted 3 years. Right—*Acmena florabunda* planted 5 years.

orchard; however, if kept trimmed, the macrocarpa will be found satisfactory.

On the northerly sides of the orchard the shelter usually need not be so high or so dense, and *Ligustrum chinensis* (large-leafed privet), *Pittosporum crassifolium* (very suitable for coastal shelter), *Acmena florabunda*, or *Hakea saligna* should provide sufficient shelter. In districts where the winter is not severe the feijoa can be used for shelter on the northerly side of the orchard; as well as providing a 10 to 12ft. shelter, it supplies a very useful fruit.

If possible the shelter should be planted before the fruit trees are set out. Where that cannot be done a fast-growing temporary shelter can be provided by sowing in the warmer northern districts *Albizzia lopantha* and in the colder districts tagasaste (*Cytisus proliferus*—the common tree lucerne). Both these are more satisfactory if kept trimmed.

Satisfactory types of hedge are illustrated on pages 603 and 604.

Sufficient room should be allowed between the shelter and first row of trees in the farm orchard to permit the turning of cultural implements at the ends of the rows. Shelter trees with a fair spread should be planted at least 20ft. back from the nearest row of fruit trees. Annual cultivation and manuring for the first few years will greatly assist in the rapid and satisfactory establishment of a shelter belt.

Though different kinds of fruit trees will stand varying amounts of soil moisture, the surplus must be removed. Excess of water in the soil is primarily responsible for many of the troubles and diseases associated with fruit culture, and insufficient drainage is frequently overlooked as a "limiting factor" in the orchard.

Kinds and Numbers of Trees

Fruit trees should not be crowded; adequate space is required to permit normal growth and development. Overcrowding is a very common fault in home orchards and in later years leads to weak, spindly trees, fruit too high, and poor cropping, as well as increasing susceptibility to disease and insect attack. If a plot is large enough for only 10 trees correctly spaced, do not attempt to crowd more in or eventually disappointment will result.

The kinds of trees to plant depend on soil and climate limitations as well as on available room and personal preferences. Advantage should be taken of the varying preferences of the different kinds of fruit trees and their tolerances to moisture to select those best suited to the soil conditions.

To a large extent climate governs the locality in which certain fruits

POPULAR CITRUS VARIETIES

Upper—Meyer lemon planted 4 years. Middle—A well-grown young mandarin tree. Lower—Wheeny grapefruit planted 4 years.

DISTRICT	VARIETY	USE	PERIOD OF MATURITY
	Apples		
C.O.	Irish Peach	Dessert	January
C.O.	Beauty of Bath	Dessert	January
A.H.W.N.C.O.	Gravenstein (either of the red strains, Albany Beauty or Oratia Beauty)	Dessert-culinary	January-February
A.H.W.N.C.O.	Mobbs Royal	Culinary	February-March
H.W.N.C.O.	Cox's Orange Pippin	Dessert	February-March
C.O.	Lord Wolsely	Culinary	February-March
A.	Kidd's Orange Red	Dessert	February-March
A.H.W.N.C.O.	Red Jonathan	Dessert	March
H.W.N.C.O.	Red Delicious	Dessert	March-April
A.H.W.N.C.O.	Golden Delicious	Dessert	March-April
A.H.W.N.C.O.	Rome Beauty	Dessert-culinary	April
C.O.	Reinette du Canada	Dessert-culinary	April
H.W.N.C.O.	Sturmer	Dessert-culinary	April-May
A.H.W.N.C.O.	Granny Smith	Dessert-culinary	April-May
A.H.W.N.C.O.	Ballarat	Culinary	May

The growing of two varieties on one tree has much to commend it for the small home orchard, but care should be taken to see that the varieties are equal in vigour. If one is a strong grower and the other weak, an unbalanced tree will probably be the result, with the strong grower completely dominating the weaker.

Pears

A.H.W.N.C.O.	William Bon Chretien	Dessert-culinary	February
A.H.W.N.C.O.	Beurre Bosc	Dessert-culinary	March
A.W.N.C.O.	Louise Bonne de Jersey	Dessert	March
A.H.W.N.C.O.	Winter Cole	Dessert	March
C.O.	Winter Nelis	Dessert	April
A.H.W.N.	P. Barry	Culinary	April

William Bon Chretien is the best of the pears for bottling, but for its satisfacotry pollination some other variety, such as Beurre Bosc, Louise Bonne de Jersey, or Winter Nelis is necessary.

Peaches

A.H.W.N.C.O.	Briggs Red May	Dessert white flesh	December-January
C.O.	Mayflower	Dessert white flesh	December-January
C.O.	Hales Early	Dessert white flesh	January
A.H.W.N.C.O.	Wiggins	Dessert white flesh	January
A.H.W.N.	Paragon	Dessert-culinary yellow flesh	February
A.H.W.N.C.O.	Peregrine	Dessert white flesh	February
A.H.W.	Stark	Dessert white flesh	February-March
C.O.	Muir	Dessert yellow flesh	March
A.H.W.N.C.O.	Mary's Choice	Dessert yellow flesh	March
A.H.W.N.C.O.	Golden Queen	Culinary yellow flesh	March
A.	Osprey Improved	Dessert white flesh	March-April
A.W.N.C.O.	Hobb's Late	Dessert-culinary white flesh	April

A novelty is Black Boy, with flesh and juice the colour of port wine and excellent for jam and bottling. Golden Queen and Mary's Choice are excellent bottling peaches.

Nectarines

A.H.W.N.C.O.	Early Rivers	Dessert	February
A.H.W.N.C.O.	Goldmine	Dessert	February-March
A.H.W.	New-boy	Dessert	February-March

Plums (Japanese and hybrids)

A.H.W.N.	Wilson's Early	Dessert-culinary	December
A.H.W.N.	Early Jewel	Dessert	December-January
N.C.O.	Sharp's Early	Dessert-culinary	January
A.H.W.N.C.O.	Billington (red-fleshed)	Dessert-culinary	January
A.H.W.N.C.O.	Burbank	Dessert-culinary	January
A.H.W.N.C.O.	Santa Rosa	Dessert	January-February
A.H.W.N.	Sultan (red-fleshed)	Dessert	February-March
C.O.	Purple King	Dessert	February-March
A.H.W.N.C.O.	Victory	Dessert	March-April

A new variety certain to become popular is Elephant Heart, a red-fleshed freestone plum, which is excellent for bottling.

Plums (European)

H.W.N.C.O.	Angelina Burdett	Dessert	January
	Evans Early	Dessert-culinary	January
	Reine Claude de Bavay	Dessert	February-March
	Kirkes	Dessert	March
	Grand Duke	Dessert	March
	Monarch	Dessert	March
	Yellow Magnum Bonum	Culinary	March
	President	Dessert	March

Apricots

N.C.O.	Newcastle		January
	Dundonald		January-February
	Moorpark		February

Cherries

C.O.	Early Lyons		Early
	Bedford Prolific		Mid-season
	Florence		Late
	St. Margaret		Late

Quinces

A.H.W.N.C.O.	Smyrna		Mid-season
	Champion		Mid-season

European plums, apricots, and cherries do not fruit satisfactorily in the milder climates of the North Island and are not recommended for those districts, with the exception of some parts of Wellington and Hawke's Bay. For satisfactory pollination of European plums more than one variety should be planted.

Recommendations of Fruit Tree Varieties for Specific Locations

Berry Fruits

Berry fruits, such as raspberries and currants, do not fruit satisfactorily in the northern districts of the North Island, and even gooseberries seldom fruit well north of the Waikato district.

Gooseberries.—Farmer's Glory (red), Gregory's Perfection (yellowish-green), Ploughboy (red).

Raspberries.—Lloyd George, Northumberland Fillbasket, Red Antwerp (Nelson district).

Loganberries.—Red Logan.

Black Currants.—Boskoop Giant, Daniel's September.

Red Currants.—Fay's Prolific.

Strawberries.—North Island: Captain Cook, Helensiea Surprise, Marguerite. South Island: Melba, Royal Sovereign, Laxton's Noble.

Subtropical Fruits

Subtropical fruits require mild winter climates, but given well-sheltered, warm conditions can be grown with reasonable success even in districts which experience several degrees of frost.

Lemons.—Lisbon; Meyer—a lemon-orange cross, having less acidity than the Lisbon lemon, dark green foliage, and orange-coloured fruits; it is more dwarf growing and slightly more frost resistant than the Lisbon and crops very heavily for its size.

Grapefruit.—N.Z. Morrison's Seedless—suitable for marmalade purposes in June and July and as a grapefruit from August to October; Wheeny—a recent introduction of the American type of excellent quality, with large, thin-skinned, pale lemon, very juicy fruit; requires warmer and more protected conditions than the Morrison's Seedless; ripens in November-January.

Sweet oranges.—Best's Seedless, Robertson's Navel, Maltese Blood.

Mandarins.—Satsuma, Temple.

Tree tomatoes.—Very frost-sensitive shrubs which require sheltered, warm, frost-free conditions and good drainage; very easily grown in such positions, but will not stand drought. The red, or so-called black, variety is the more popular and has a longer season, but the yellow variety is to be preferred for the main planting for the home garden, being much less acid and of better flavour. The yellow variety is excellent for bottling.

Chinese gooseberry.—Deciduous and will stand more frost than the tree tomato, but not late frosts; it requires moist conditions in the summer. Both male and female plants are required to secure fruiting; where several are being planted one male is required for every five female plants.

Passion fruit.—The round, purple, medium-sized variety (*Passiflora edulis*) is recommended for the warmer climates; this fruit is not as hardy as the Chinese gooseberry, but when planted in warm, sheltered positions can be grown in districts which experience several degrees of frost. For the colder climates the "banana" and "egg" passion fruit will prove satisfactory if planted in reasonably-warm and sheltered positions.

Feijoa.—This attractive shrub carries green, oval fruits of delicious perfume and flavour and should be more widely grown in the home garden. Recommended varieties are Choiceana, Coolidgii, and a new cross which is claimed to be superior, Mammoth.

Passion fruit can be used to cover the wall of a garage or shed or grown on a trellis to hide an untidy corner.

may be grown successfully. For instance, citrus fruits are mostly confined to the milder parts of the North Island, as are such subtropical fruits as passion fruit, Chinese gooseberries, feijoas, and tree tomatoes, the last-named being particularly frost-sensitive. On the other hand, such fruits as apricots, cherries, raspberries, and currants require a climate of relatively severe winters, with a longer resting period, and are therefore largely confined to the colder southern climates. Apples, pears, and such stone fruits as peaches and plums exhibit a wider tolerance of climate and may be grown in most districts, but for stone fruits a relatively-dry autumn is desirable. In the home orchard only fruits which do well under the conditions should be planted.

Avoid planting more trees than can be looked after conveniently. Half-a-dozen well-tended trees will give more fruit and pleasure than double or treble the number of ill-tended ones.

Here are the approximate times from planting taken by average trees and plants before they begin to crop satisfactorily.

	Years
Strawberries	1 to 2
Raspberries, gooseberries, currants, tree tomatoes	2
Passion fruit, grapes, chinese gooseberries	3
Peaches, nectarines, Japanese plums, feijoas	4
N.Z. grapefruit, lemons, apricots	5
Apples, quinces, sweet oranges	6
Pears, European plums	7

Varieties to Plant

Where the orchard is extremely limited in extent there may be room to set out only one or two of the kinds most favoured. For larger areas some consideration should be given to providing a succession of fruits to spread the fruiting period as much as possible. In the milder parts of Auckland Province it is possible to produce fresh fruit in each month of the year, and it is usually preferable to produce a little fresh fruit each month rather than a lot in only one or two months. In the colder climates apples will provide the main home fruit supply during the winter, and two or three good-keeping and late-maturing varieties should be grown to provide fruit for home storage during those months. Some thought should also be given to the growing of suitable varieties of stone fruit for bottling.

It is not possible to recommend varieties for planting in each district in New Zealand or to provide for all tastes, but the kinds and varieties listed on the opposite page will provide a guide from which a selection can be made to suit most conditions. Suitability to different districts is indicated by the following initials: A. Auckland, H. Hawke's Bay, W. Wellington-Taranaki, N. Nelson-Marlborough, C. Canterbury, and O. Otago-Southland.

Planting

Trees and plants should be ordered early in the year from a reliable nurseryman. The late placing of orders may result in disappointment through non-fulfilment of the order or the receipt of a poorer grade of trees. Strong, well-branched, two-year-old trees will prove the most satisfactory. Beware of trees with weak, spindly growth or trees four or five years old which have been cut back in the nursery.

When trees are received from the nursery they should be unpacked and

Tree tomatoes, which are shallow rooting, should be staked when young.

ESTABLISHING A HOME ORCHARD . . .

heeled in without delay in a shady position to await being planted in their permanent positions; take care that the roots are well covered with earth.

Late autumn planting is recommended where the soil is light and drainage good, with two exceptions—citrus trees and in climates with severe winters. For these planting is best done in early spring.

The larger trees, such as apples, pears, peaches, plums, apricots, and cherries, should be spaced 12 to 18ft. apart according to soil and growth conditions. The farm orchard should be planted with the trees about 18ft. apart in rows, with 18ft. between the rows. Planting on the square system will facilitate ploughing and cultivation being carried out both ways, and make the general maintenance of the orchard more easy.

Because of their evergreen nature, grapefruit, oranges, mandarins, and lemons—especially the Meyer lemon—make excellent shrubs for the front lawn, and more use could be made of these fruits for this purpose.

From half a dozen to a dozen bushes each of raspberries, currants, and gooseberries are usually sufficient for the average home orchard. They may be planted in a row along the edge of the path or used as a dividing break between flower and vegetable gardens.

Raspberry bushes may be as close as 2ft., gooseberries 3ft., and currants 3 to 4ft. If more than one row is required, 5ft. should be allowed between rows.

Loganberries should be grown along a fence or trellis with 8 to 10ft. between plants.

Strawberry plants should be 12 to 15in. apart with 2ft. between rows. It is an advantage to plant strawberries in raised beds to secure the benefits of good drainage and a free root run.

All berry fruits benefit from being planted in positions where they get full sunshine for the ripening of their fruits.

Passion fruit and Chinese gooseberries both need support and should be grown along or over a trellis or fence. Passion fruit can be used to good effect to cover a wall of a garage or shed, or grown on a trellis to hide an untidy corner or bank. A cool, moist root run in summer is an advantage. Chinese gooseberries are vigorous plants and need plenty of room to extend; they should be planted from 15 to 20ft. apart. Passion fruit may be planted 12 to 14ft. apart. The taller-growing fruits should be against the southern boundary fence and the shorter kinds in front on the northern side. That obviates the shading which is likely to occur if the taller fruits are planted on the sunny side and the smaller kinds behind.

If at all exposed to wind, tree tomatoes should be provided with firm support such as a sturdy stake, as they are shallow rooting and easily blown over. They may be as close as 8ft. in the row. They should be planted in sheltered, warm positions, but will not thrive if the soil is too dry.

Holes for the trees should be dug, if possible, some time before planting. The topsoil should be carefully removed, a second spit taken out, and the topsoil put in its place. A light dusting with burnt or hydrated lime will be found beneficial.

Before being planted the roots of the plants will require attention. When received from the nursery the roots will usually be torn and broken, and if planted in this condition, they will tend to decay and die back from the tips. The heavy roots should be cut back to about 3in. and the lighter and fibrous roots cut away. Citrus trees are usually received from the nursery "balled" and so need little if any root trimming, but at planting the ball should be gently broken if it has become at all hard.

Before planting each tree lightly fork into the soil at the bottom of the hole 1lb. of blood and bone manure. Set the trees about 3in. deeper than they were in the nursery rows, with the exception of citrus, which should be set at the nursery depth; the soil mark on the trunk will indicate the depth at which the tree was planted in the nursery. Fill in round the tree by digging in topsoil from around the hole; that ensures that only topsoil is around the roots, and it also breaks the wall around the hole.

The essential factor in planting is to fix the tree firmly by treading the soil around the roots. The final layer of soil should be placed loosely around the tree, with the level slightly above the usual ground level to allow for settling.

After deciduous trees have been planted the tops should be pruned to two or three sturdy leaders, which should be shortened to about one-third of their length. Failure to do that may result in poor establishment and weak growth for the first year, if not longer. Citrus trees will not require much heading back of the main shoots, but the leaders should be defined by cutting out all but two or three strong shoots.

Where grass-grub has been troublesome in strawberry beds, spread along the positions of the rows just before planting lead arsenate at the rate of 1lb. to 100ft. of row and lightly fork it into the soil.

All photographs by Sparrow Industrial Pictures Ltd.

Lord Bledisloe Broadcasts To New Zealand Young Farmers

BEFORE leaving New Zealand Viscount Bledisloe delivered a national broadcast to members of the New Zealand Federation of Young Farmers' Clubs, and on behalf of the National Federation of Young Farmers' Clubs of Great Britain he extended greetings to the New Zealand organisation. As a former Grand Patron of the New Zealand Federation he spoke of his interest in the New Zealand movement and told the young farmers of New Zealand that they were pursuing the most ancient and the most vital of all human occupations. Referring to the work carried out in the Dominion, Viscount Bledisloe complimented the organisation on its useful activities and made special reference to educational tours, debating, and stock judging. He indicated his interest in the Y.F.C Land Settlement Scheme as submitted to the Government. He also expressed his admiration for the proposed national Y.F.C. memorial to commemorate the sacrifice of those who lost their lives in the late war, stating, "I like especially the suggested provision of buildings at Massey and Lincoln Agricultural Colleges to provide additional facilities for short courses in farming and kindred subjects for members of your clubs. May you succeed in raising sufficient funds to carry out this worthy and ambitious project. Less than 1 per cent. of the prospective farmers in this Dominion receive the inestimable advantage of scientific and technical training at an agricultural college or university. In view of the great strides of scientific knowledge and technology as applied to primary production, such a training is becoming more and more essential to complete success in husbandry, even amid such ideal conditions of soil and climate as you are privileged to enjoy in this highly favoured outpost of the British Commonwealth and Empire."

MAIZE GROWING FOR GRAIN

Bulletin No. 269, "Maize Growing for Grain," dealing with the sowing, cultivation, and harvesting of the maize crop, is now available **free** from any office of the Department of Agriculture.

Covering Haystacks With Rushes

By K. M. MONTGOMERY, *Fields Instructor, Te Kuiti.*

AS a result of drought conditions during the summer and autumn of 1945-46, the relatively-small tonnage of hay saved in New Zealand was practically all consumed during the past winter. Only on odd farms is there a carry-over for the winter of 1947.

IN the northern King Country the weather was not favourable for the hay harvest of 1946-47; cold winds and rains retarded growth and most crops were light. Despite that a very large area has been harvested, and it is apparent that farmers have endeavoured to build up a reserve of supplementary fodder in the form of hay so that they will not be caught short of feed in the winter of 1947.

However, it is hard to understand why, after expending considerable money, time, and energy in winning a hay crop, it is allowed to become spoilt by not being adequately protected from the weather. The photograph of the stack on the left below was taken less than 9 months after it was built, and it is easy to imagine how much hay will be wasted when the farmer comes to feed it out.

Useful Materials Wasted

Before the war corrugated iron was easily obtained and was much in use for the protection of haystacks; it was not uncommon to see large rectangular stacks well covered with this material. But with corrugated iron unobtainable farmers had to turn to other materials with which to protect their haystacks from the weather.

Despite the shortage of sacks, many stacks are still being covered by sheets made of fertiliser sacks, but though these sheets serve a purpose, they seldom last for more than one season unless treated with a preservative, such as bluestone, to prevent the growth of moulds which destroy the fibre. Moreover with sacks for the distribution of fertiliser and lime in such short supply, it is wasteful to use them for haystack covering.

Instead of using material in demand for other purposes, some consideration should be given to using what might be termed waste material, and a typical one is the common rush. In many districts of Auckland Province this plant grows to profusion, and, though it is not on every farm, it is within easy distance of many.

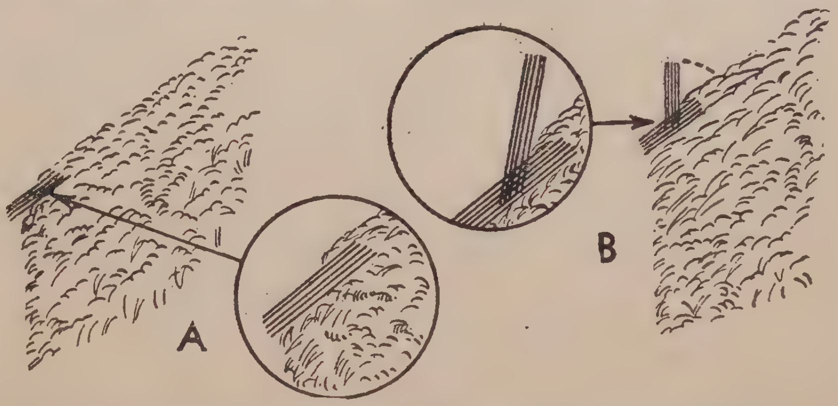
Method of Laying Rushes

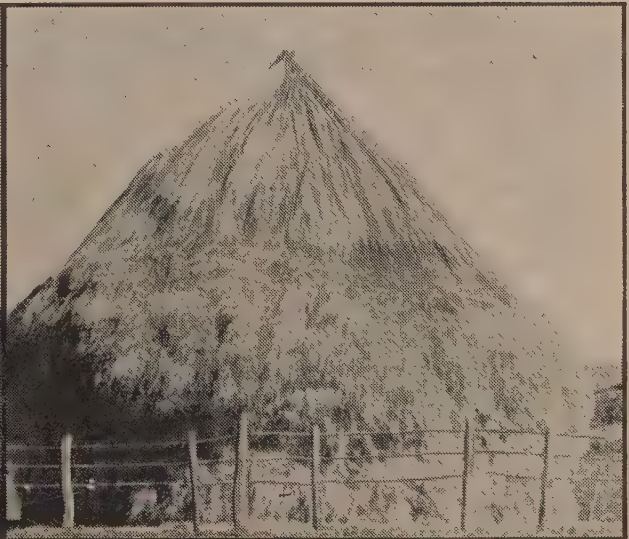
The photograph on the right below shows a haystack built and well covered with rushes by Mr. T. Cumpstone, Otorohanga. His method is briefly as follows:—

At harvest time the stack is well topped up and allowed to settle. Before thatching is begun a small cock of hay is used to top up finally. In applying the rushes no strings or pegs are used, but the top end of the first layer is let in under the hay (A below). The next layer is made to knit into the first by pushing it in at an angle of 45 degrees and then allowing it to lie down on the stack (B below). That process is repeated until the top of the stack is reached, when the final layer is gathered and tied around a peg driven into the centre of the top of the stack. As each layer is added the fingers are raked gently through the rushes to remove any lying crosswise and allow the others to compact. A depth of 2 to 3in. of rushes is sufficient to turn the heaviest rain experienced in the northern King Country.

The stack in the photograph is 22ft. in diameter at the base, and Mr. Cumpstone covered the top in 4 hours.

[*Photographs by Desgranges Studios, Te Kuiti.*





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Control of Fermentation in Honey By Indirect Heating and Drying

By W. J. FIX, *Apiary Instructor and Honey Grader, Auckland, and*
T. PALMER-JONES, *Research Officer, Animal Research Station, Wallaceville.*

THE principal cause of fermentation in extracted honey is excess moisture, and fully-capped combs of apparently-ripe honey removed for extraction are the main source of that moisture. This article describes a drying plant which will remove excess moisture from comb honey and honey in settling tanks by indirect heating and lowered humidity.

THE beekeeping industry must be prepared to produce and pack honey that will maintain its original flavour and condition under normal storage from season to season. Loss of flavour and condition, a problem concerning every commercial producer, is caused almost entirely by fermentation, which is brought about by the growth of sugar-tolerant yeasts. Yeasts capable of fermenting honey occur in the nectar of flowers visited by bees, on the bodies of bees, and in the soil surrounding an apiary, and bees carry them to the combs in the hives. Recently-extracted honey usually contains yeasts, often in great numbers. Normally, yeast growth is inhibited by the high sugar concentration of honey and the yeasts die out, but if the moisture content is sufficiently high, the sugars become less concentrated and the yeasts increase to a point at which fermentation occurs.

Excess moisture in honey is the main cause of fermentation, though minor factors such as temperature and granulation have some effect. The importance of the moisture content is recognised in grading, the standard allowable for first-grade New Zealand honey being 17.2 per cent. moisture. Fermentation in granulated honey becomes more likely as the moisture content rises above that level.

Honey that has passed through a stage of fermentation will not respond to treatment; if the yeasts are killed by heat or drying, the sour flavour still remains and the honey can be improved only by blending it with sufficient normal honey to mask the sour flavour. Two methods are available for preventing fermentation in extracted honey.

In the first yeasts are killed by heating the honey. It is much practised in the United States of America, where most honey is pasteurised. Such honey will keep even if the moisture content is high. That method would not be suitable in New Zealand, as the product is a liquid honey.

The second method depends on treating the honey so that it will not support yeast growth, and after much experimentation the authors attained this by designing a plant that would remove excess moisture from the honey.

Preliminary experiments showed that this could best be achieved by a plant constructed in two separate units:

1. A comb drying room, where excess moisture was dried out of combs brought in for extraction. This unit would also arrest fermentation in combs awaiting extraction.
2. A tank drying room, where a further reduction in moisture could be brought about.

Sources of Moisture

Fermentation of extracted honey because of high moisture content has been considered to be caused by the absorption of moisture by honey during extraction and while in the settling tanks. Specific gravity determinations on the top and bottom layers of honey in settling tanks show that the top layer usually has a higher moisture content than the bottom one. The generally-accepted view has been that the main source of excess moisture in extracted honey is that absorbed from the atmosphere by this top layer of honey. Typical figures from extracting plants are given in Table I on next page.

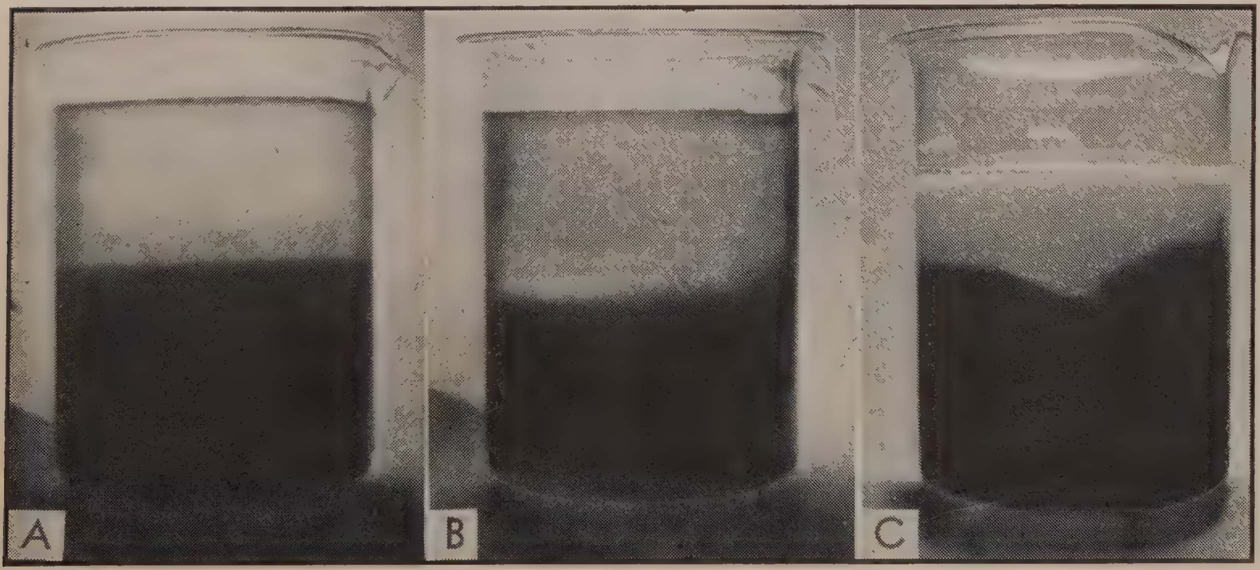

Fig. 1—Separation of honey in a tank drying room. A shows a distinct separation. B shows the bottom layer of honey beginning to lift after prolonged exposure in a miniature tank drying room. C is a later stage than B.

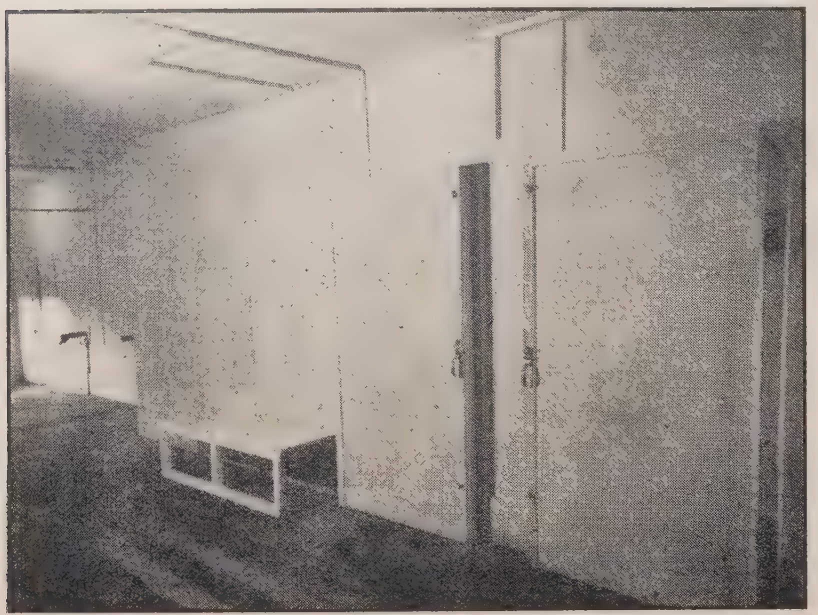

Fig. 2—Drying rooms with doors closed photographed from extracting room floor.

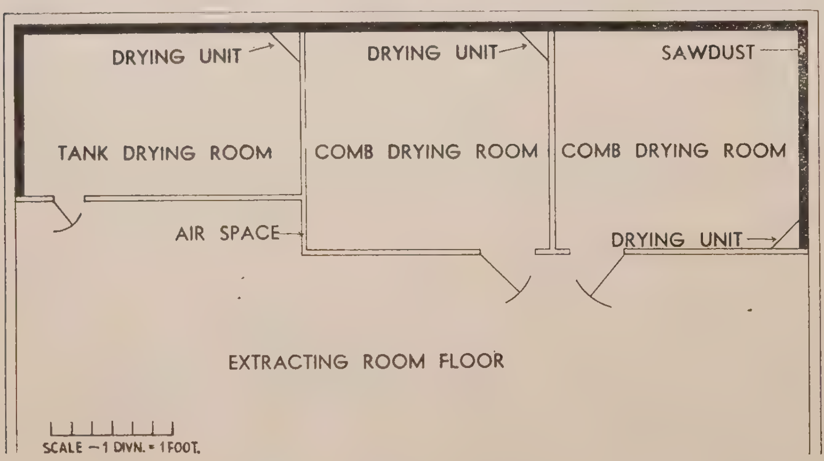

Fig. 3—Plan of drying plant.

The theory that most excess moisture is absorbed from the atmosphere by the top layer of honey was checked by exposing various honeys on waxed boards to determine the rate of absorption of moisture. Results showed that penetration of moisture under the most favourable conditions was limited to a thin surface film which would be removed by the usual skimming of settling tanks.

It was apparent that absorption of moisture by tank honey could not account for the excess moisture often met with after extraction.

Though it has been recognised in America that fully-capped combs removed from the hives for extraction may contain honey with excess moisture, the problem does not appear to have been studied there in detail. The occurrence of similar conditions in New Zealand was thought by the authors to account for the high moisture content of the top layer of tank honey, which would result from separation of such comb honey after extraction in the ripening tanks, the portion with a high moisture content rising to the surface.

TABLE I

Location of extracting plant	Percentage of moisture in top layer of honey in settling tank.	Percentage of moisture in bottom layer of honey in settling tank.	Difference
North Auckland	17.8	17.4	.4
North Auckland	17.2	16.8	.4
South Auckland	17.2	15.4	1.8
South Auckland	16.4	16.0	.4

Moisture in Fully-capped Combs

In checking that theory the first step was to show that excess moisture did occur in combs apparently ripe for extraction.

The Chataway honey hydrometer will register the moisture content of 1lb. of honey cut from the comb and strained, but the result is an average covering portions of honey that may be normal and those that may contain an unusually-high percentage of moisture. Moreover the high temperature, 122 degrees F., to which honey is heated for this test prevents the formation of layers and gives a homogeneous sample. It was thought that small areas of comb might often contain excess moisture which the Chataway hydrometer, depending on a composite sample, would not detect.

The flotation test was designed to test the gravity of a small volume of honey—about ½ fluid ounce. Ordinary honey samples were first tested by the honey hydrometer to give a range of standards of known moisture content. Then small sections were removed from the comb under test and placed in jars with liners. Heat was applied and the wax brought to the surface and removed, leaving a sample of about 1 fluid ounce of honey, sufficient for two tests. A small volume of one of the standard honeys was run into a test tube and a small sample of the comb honey under test run on to its surface. Even if both samples were slightly stirred, separation occurred, the lighter-bodied honey rising to the surface. Experimentally, separation was shown by using honeys of different colours; if that was impracticable, a few crystals of a dye such as crystal violet were used to dye the sample the moisture content of which was being compared. Honeys of varying moisture content will not separate once they have been heated to a temperature above 160 degrees F. In practice it was found that a temperature of about 90 degrees facilitated separation.

This test was repeated, using different standards, until representative samples had been covered from the whole comb. The test was also used to compare honeys from different areas of the same comb against each other. Results commonly showed marked variation in moisture content for different areas of the same comb, the moisture in many cases being excessive.

The test is accurate only within certain limits, but it was capable of showing that considerable variation in moisture content usually occurs between different areas of honey on the same comb, and that excess moisture is often present.

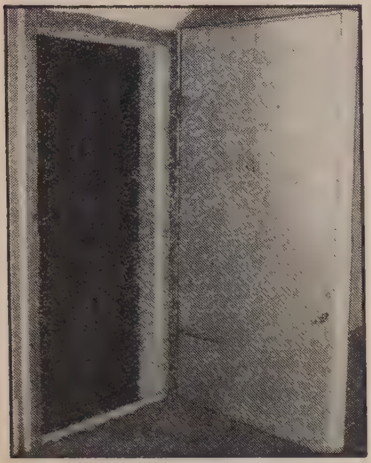

Fig. 4—Drying room door and frame. The strip of wood on the floor is removed when honey is being taken in or out of the room. The door is fastened with three wing nuts and sealed with old inner tubes.

Separation in Ripening Tanks

Layering of honey occurs at temperatures which are normal in tank rooms. Honey passing from a comb drying room through the extractor into the tanks in a tank drying room will immediately begin forming layers, this process being accelerated as its temperature builds up.

Fig. 1 shows this layering as it occurs in the tanks in a tank drying room. The honey tanks are represented by glass beakers of similar proportions, holding about 1lb. of honey. A high-gravity birch honey (15 per cent. moisture) was poured into the beakers, followed by a low-gravity clover honey (18.4 per cent. moisture). Honeys passing into tanks in the tank drying room after treatment in the comb drying room would not show such a marked difference in moisture content. A few crystals of a dye were mixed into the birch honey so that when separation occurred the two honeys were sharply differentiated.

It has been found that pumping honey from the extractor to the honey tanks does not materially affect separation.

As no direct heat is applied to honey during the operation of the authors' plant, its effect on separation in the tank drying room is not considered.

This separation clearly causes the higher moisture content of the top layers of honey in ripening tanks, and the same principle is used in the flotation test.

Fermentation and High Yeast Count

High moisture content of honey and fermentation are related, and consequently it would be expected that, as much honey apparently ripe for extraction contains excess moisture, it would also frequently show signs of fermentation. Field observation supplied many instances of fermentation in such combs. Bacteriological examination of fully-capped comb honey removed from hives disclosed that many combs had a high yeast count; there was a general correlation between high yeast count and presence of excess moisture.

Sufficient evidence has been collected to indicate that in many instances honey may be of low gravity while in capped combs on the hive. Yeast counts on comb honey removed from hives are often very high, even when the honey is not actively fermenting. Though such honey normally may contribute only a small volume to the total passing through an extracting plant, its presence is of great importance for the following reasons:—

1. If fermentation is occurring in the combs, they will contribute a large inoculum of yeasts to the bulk honey being extracted. That will hasten fermentation in the extracted honey if conditions become suitable for yeast multiplication.
2. Sufficient fermented honey may enter the bulk honey during extraction to give it a sour taste even if conditions are such that the extracted honey will not support the growth of yeasts.
3. The most important effect of such low-gravity comb honey is often to depress the gravity of extracted honey to an extent likely to favour fermentation.

Drying of Honey

It appeared that fermentation in extracted honey could be controlled by drying combs before extraction and by housing the settling tanks in a tank drying room. It was considered that this method would raise the gravity of the extracted honey sufficiently to prevent the growth of yeasts. Accordingly, a miniature plant for drying honey was constructed on these lines.

Comb Drying Room

A miniature insulated drying room with a thermostat set at 90 degrees F., so that fan and heating elements cut off together, was used to reproduce large-scale conditions. Its internal dimensions were 14in. each way and relative humidity in it was maintained at 35 per cent.

The first series of experiments was arranged to study the effect of drying on combs placed in a drying room before extraction. Removal of excess moisture from honey combs before extraction is of primary importance as, even if yeasts are present in large numbers in combs, they will not cause fermentation in the extracted honey if its gravity is increased sufficiently by drying. Yeast counts on one of the combs subjected to drying exemplified that. Two methods of drying were tried, honey in fully-capped combs being treated in the first and honey in uncapped combs in the second.

Fully-capped combs of honey were cut in halves, the honey from one half being tested for moisture and the other half being exposed to drying before being tested. The cells in uncapped combs were filled with a honey of known moisture content, the content being redetermined after exposure to drying.

Capped combs responded well to conditions easily attainable in an efficient comb drying room. Honey with only 16 per cent. moisture (specific gravity 1.4283) was reduced to 15.4 per cent. moisture (s.g. 1.4325) within 24 hours, and honey with 20 per cent. moisture (s.g. 1.4005) was reduced to 18.4 per cent. (s.g. 1.4115). Uncapped honey also dried out well in this period.

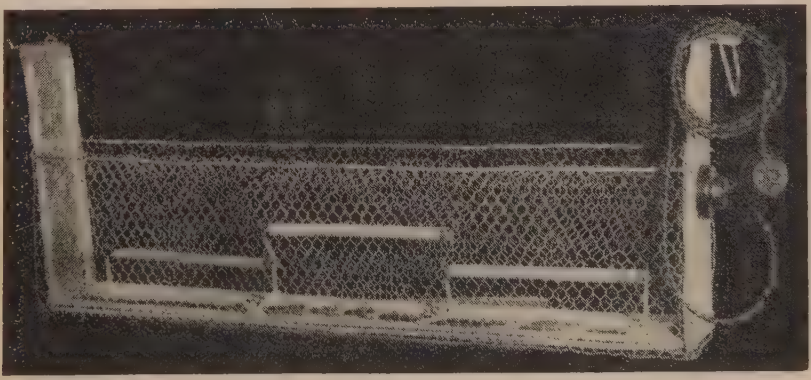

Fig. 5—Heater used in comb and tank drying rooms. The frame is built of 3in. galvanised iron and the lower part holding the elements is covered with bird netting.

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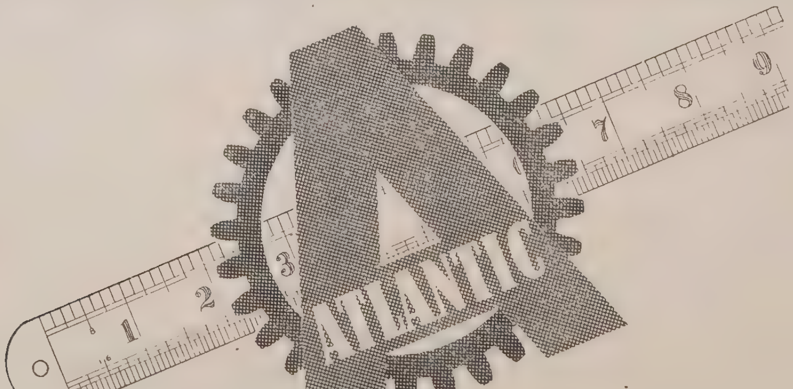

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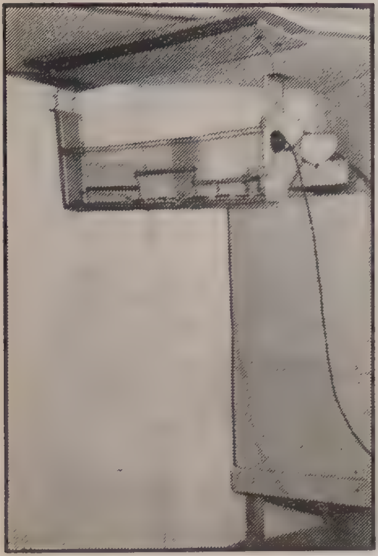


Fig. 6—Drying unit in comb room. The chute in both tank and comb drying rooms is fitted under the fan diagonally across the corner of the rooms, its centre being 12in. from the corner.

Tank Drying Room

The same drying chamber, run at 90 degrees F., was used to duplicate conditions in a tank room in which light- and heavy-bodied honeys run together into tanks were exposed to drying. Such honey mixtures separate, and the top layer of light-bodied honey, containing most moisture, is the one which is dried first. When drying has proceeded sufficiently it drops down in the tank and its place is taken by another layer of honey, which is dried in turn.

Ordinary glass beakers, 3in. in diameter, with a capacity of 1lb. of honey, were used as miniature tanks. Two honeys, one of 18.2 per cent. and one of 16.0 per cent. moisture, were used. The heavy-bodied honey was poured in first, followed by the light-bodied honey. In all cases the honeys soon separated, the light-bodied forming a distinct top layer. The formation of layers was easily seen, as the honeys were light and dark in colour. Beakers were weighed before the honey was poured in.

In all cases the top layer was 3cm. deep (2.54cm.=1in.) and the beakers were exposed in the drying chamber for 49½ hours. A beaker of one honey (18 per cent. moisture) left outside the drying chamber remained unchanged for five days; the six beakers exposed in the drying chamber averaged a loss of slightly more than 0.4 per cent. of moisture.

The experiment was repeated, using one honey of uniform moisture content (18.4 per cent.). That allowed Chataway hydrometer readings to be taken at the end of the tests; such readings would be used in the field to check drying action. The results of this experiment are summarised in Table II below.

Percentage loss in moisture registered by the Chataway hydrometer shows reasonably close agreement with the figures obtained by weighing. Chataway hydrometer readings were not made for beakers A and D, as these contained a large percentage of manuka honey, which affects the accuracy of this instrument.

Tank honey responded well to conditions easily attainable in a tank drying room, the loss in moisture content ranging from slightly more than 0.4 per cent. to 3.6 per cent., depending on the time of exposure to drying and the moisture content of the honey.

A combination of comb and tank drying rooms is necessary for removal of excess moisture; the bulk of it is removed in the comb drying room and the tank drying room finishes the operation.

Large-scale Plant Described

The results from this miniature plant were so satisfactory that a large-scale plant was put into operation. The plant has functioned satisfactorily throughout a season in the North Auckland district. Installation of such plants can now be confidently recommended, and sufficient details of the existing plant are given to enable that to be done. The plant described is that of Mr. J. Gavin, Titoki, Whangarei, whose co-operation is acknowledged.

TABLE II: SUMMARY OF RESULTS OF DRYING USING ONE HONEY OF 18.4 PER CENT. MOISTURE.

Beaker	Time of Exposure	Specific gravity of honey (1.4115 at start experiment)	Loss of moisture	
			By weighing (per cent.)	By Chataway hydrometer (per cent.)
	at 90 degrees F.			
A	42 hours	1.418	.9	
B	42 hours	1.416	.58	.6
C	46 hours	1.414	.51	.4
	at 98.6 degrees F.			
E	49½ hours	1.417	.85	1.0
D	5 days 23½ hours	1.435	3.6	

It is in two separate units, comb drying rooms and a tank drying room (Fig. 2). A temperature of about 95 degrees F. and a relative humidity of from 40 to 45 per cent. are maintained in the comb drying room. Such a plant may have one or more comb drying rooms. In the tank drying room a temperature of about 97 degrees and a humidity of about 40 per cent. are maintained.

In the miniature experimental plant temperatures of 90 degrees in the comb and tank drying rooms gave good results, but in a full-scale plant a larger volume of honey at a low temperature is placed in the comb drying room. The thermostat in the room will cut off the drying unit when the air temperature reaches 95 degrees, though the temperature of the honey as it slowly warms up during the first stage of drying will lag considerably behind that of the room. The same condition applies to the tank drying room. Higher operating temperatures in comb and tank drying rooms were necessary to compensate for that factor, and also for lack of sensitivity in the thermostat.

Comb Drying Room

The dimensions of the comb drying room are 10ft. 9in. by 12ft., with a

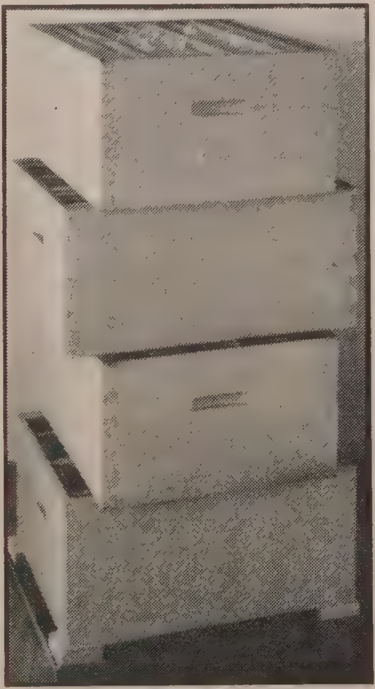


Fig. 7—Stacked supers in comb drying room. The bottom super is raised on wooden blocks and the supers above are criss-crossed to aid air circulation.

7ft. stud. The room is built within a large honey house so that its outer walls are not exposed to the weather. The walls, ceiling, and door are covered with absorbent wallboard inside and out. All outside walls are packed with sawdust, and the inside walls have an air space of 3in. (Figs. 2 and 4).

Three 1000-watt elements, fitted into a frame suspended by four hooks from the ceiling diagonally across a corner of the room, are used for heating (Fig. 5). A 15in. fan for air circulation is attached directly to the shaft of a ¼ horsepower motor, operating at 1420 revolutions a minute. This motor is fitted to a bracket in the corner of the room, and an air chute is built out to the tips of the blades at the top and down to about 12in. from the floor at the bottom (Fig. 6). The heater is placed from 2ft. 6in. to 3ft. 6in. in front of the fan. The most satisfactory results are obtained by placing the fan slightly above the coils of the heater to direct air drawn up the chute mainly through the space between the top element and the ceiling; that arrangement ensures efficient distribution of the heated air. A thermostat set at 95 degrees F. is wired into the circuit with a flexible lead so that fan and heater cut off together.

When combs are removed from hives and taken to the extraction plant the temperature of the honey falls. Immediately on arrival at the plant the combs are placed in the comb drying room, which brings their temperature back to that of the hives. The supers are stacked in criss-cross piles to assist drying and heating. Wooden blocks in the corners of drip trays are used to raise the bottom super in each pile 2in. above the floor, so allowing a free circulation of air (Fig. 7). Setting the plant in operation before the arrival of the honey is unnecessary, as the room temperature can be raised to 95 degrees within 40 minutes.

Experimental work shows that exposure in the comb drying room for from 24 to 48 hours is usually sufficient, but as the composition of honey is governed by both climate and management, additional exposure may be necessary.

If it is desired to hold the honey for a period before extraction, the comb drying room is first operated as usual and, when the honey has been sufficiently dried, it is held at a lower temperature to prevent overdrying. It has been found that a temperature of about 75 degrees F. maintains the humidity of the room at about 65 per cent. and prevents the stored honey from losing moisture. As the temperature of the honey drops to that of the room during the holding period, it will be necessary to operate the drying room at its usual higher temperature for a sufficient period to raise the temperature of the honey to about 85 degrees before extraction. A temperature of 75 degrees favours growth of yeasts in low-gravity honey, so it is first necessary to dry honey in the combs before holding it at that temperature.

The heater and fan units were originally designed to operate at their optimum in comb drying rooms 10ft. by 9ft. with a 7ft. stud. Such rooms would have a capacity of 100 supers in staggered piles. The rooms used in the plant described in this article are slightly larger, being 12ft. by 10ft. 9in. with a 7ft. stud; their capacity is about 170 supers. A wire screen should cover the fan in the drying units to protect those operating the plant.

Tank Drying Room

The tank drying room is 13ft. 9in. by 8ft., with a 7ft. stud. It is covered and lined similarly to the comb drying room and has the same arrangement of fan, heating elements, and thermostat. Provision is made for running the fan alone to cool the room while honey is being prepared for packing. Because working conditions would not be pleasant in this room even with the reduced temperature, the honey gates are extended through the wall.

The honey is pumped from the extractor into the strainer housed in the extracting room, and piped from the strainer into the tank room. The temperature of the honey usually falls slightly as is passes through the strainer, but that could be avoided by housing the strainer in the tank drying room, though it would be necessary to raise the ceiling of the room to secure additional height; the plant would not be overloaded by such an increase in size.

Foreign matter that is frequently imprisoned in tank honey because of rapid cooling easily rises to the surface, where it is removed by skimming. Separation also occurs at this stage, the lighter-bodied honey rising to the surface of the tanks.

Results from the tank drying room of a similar plant which has been in operation for two years showed a reduction in moisture content of 1.2 per cent. for the top layer in 30 hours. There was also a considerable reduction in living yeasts while the honey was in the tank room.

The tank which was part of the producer's original equipment and was used as a temporary measure was divided into three compartments and had a capacity of 4000lb. of honey. The capacity of the room could be increased to 5000lb.

The cost of the heater used in the plant was £3 15s., the ¼ horsepower motor and fan £9 10s., and the thermostat £3 5s.

Successful Operation

In New Zealand 17.2 per cent. moisture is the permissible maximum for honey passed for export or received at the central honey-packing depot. The plant was designed to remove moisture above that level, and it does that successfully. It is considered that in its present stage of development the plant could, if necessary, remove up to 6 per cent. of moisture.

The plant is highly successful in removing excess moisture from extracted honey and so preventing fermentation after the honey has been packed. It will also arrest fermentation which may have already begun in the comb honey before extraction. The plant will not remove sour flavour in extracted honey caused by fermentation before extraction. Sour flavour is caused partially by seasonal factors beyond control, but it is aggravated by the exposure of combs of honey to moist conditions, which promote yeast growth, before extraction. Similar conditions will cause growth of yeasts in the residual honey in wet combs after extraction. Storage of these two types of comb in a comb drying room prevents absorption of moisture and, by its drying action, arrests active fermentation with its resultant sour flavour.

Further work is being carried out on this problem.

Radio Broadcasts

RADIO talks to farmers will be given from Station 1YA, Auckland, at 7.15 p.m. on the following dates:—

July 7—"Current Farming Problems," by J. E. Bell, Fields Superintendent, Auckland, A. J. Kerse, Fields Instructor, Auckland, and H. Woodyear-Smith of the Challenge Phosphate Company.

July 14—"The Care of Cows Coming into Production," by H. W. Carbury, Veterinarian, Auckland.

July 21—"Weed Control," by R. K. Ward, Agricultural Chemist, Soil Fertility Research Station, Hamilton.

July 28—Young Farmers' Clubs session, by a representative of the Western Bay of Plenty Y.F.C. district committee.

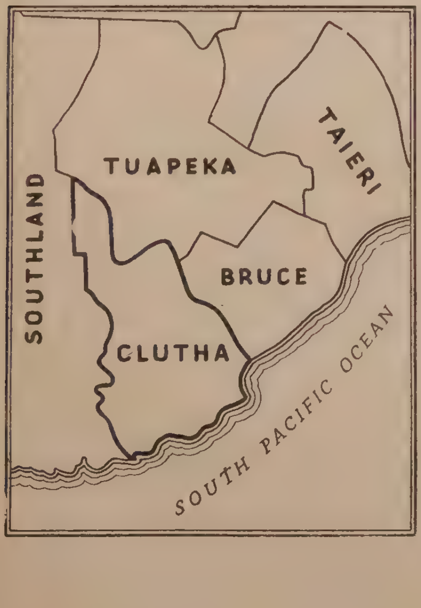
STUDIES IN FARM MANAGEMENT

A South Otago Mixed Farm

ONCE a district of large holdings of tussock-covered land, South Otago has been subdivided into much smaller units that with better farming methods and better strains of pasture plants, crop species, and livestock are highly economic under good management. The weathered mica schist of parts of the area is highly fertile. Livestock farming is the main activity, and recently there has been a great increase in the acreage of grass and clover seed saved. Without good management pastures rapidly revert to browntop, the dominant pasture species, and this article describes practices on a typical holding in the extensive "browntop belt."

By J. G. RICHARDS, *Instructor in Agriculture, Balclutha.*

BALCLUTHA, on the banks of the Clutha River, about 12 miles from the coast and 50 miles south of Dunedin, is the chief town of South Otago, which includes the greater part of the Clutha and Bruce Counties and the eastern end of the Tuapeka County. Other towns of importance in this area are Clinton, 22 miles west of Balclutha, Milton, 15 miles to the north, and Lawrence, which is about 35 miles distant, beneath the Lammerlaw Range and the Tuapeka Uplands. Owaka, the chief town of the Catlins area, is about 22 miles from Balclutha by road and rail.



South Otago is rich in the history of New Zealand's primary industry, for as early as 1840 cattle were introduced by one Willcher, in the region of the Nugget Point Lighthouse. The discovery of gold by Gabriel Reid in the Lawrence district, the huge timber resources of the Catlins area, and the wide expanse of tussock grazing lands on either side of the Clutha River were factors which led to and hastened early development.

Even in the 1860's, when Maori and pakeha were still at war in the north, wheat, oats, and ryegrass seed, and other produce were being grown on the coastal lands and on the inland heights above the goldfields at Lawrence and Waitahuna. It was on these areas that much of the foodstuffs for the fast-developing city of Dunedin was grown in the period 1850-1890.

Topography

Flowing through the centre of South Otago is the Molyneux River, more commonly known as the Clutha; this waterway, with its huge volume of water and fertile delta, is the chief geographic feature of the area. About 6 miles above the beginning of the delta the Clutha is joined on its right bank by the Pomahaka River, and this additional volume of water so near the mouth sometimes causes the Clutha to flood in its delta area. The Puerua River borders the southern side of the Inchclutha Delta and the Owaka and the Tahakopa Rivers drain the Catlins Bush district.

Until a few years ago a paddle steamer plied the Clutha River as far as Tuapeka Mouth and carried stock, wool, coal, and general produce. With the improvements in road transport and because of other factors, the steamer is no longer economic to operate.

Port Molyneux, which in the 1860's was a thriving port on the southern branch of the Molyneux River, the Koau, has been dry land since the river changed its course in the 1878 flood.

Apart from the Inchclutha delta of about 23,000 acres, and the Milton Plain of about the same area, the topography of South Otago is easily rolling to strongly rolling, and these areas are used generally for agriculture and grazing.

The dominant uplands are the Blue Mountains, which rise to 3000ft. about 20 miles north-west of Balclutha.

South of Balclutha are the Warepa Hills and beyond these the bush-covered Catlins Hills. To the north are the Waitahuna Heights and the Lammerlaw Range. The Kaitangata Hills separate Milton from the coast.

Climate

Lying between the Blue Mountains, the Waitahuna Heights, and the Warepa Hills is what may be termed

SOUTH OTAGO SOILS . . .

the Balclutha-Clydevale depression, and the rainfall over this area is influenced by the presence of these uplands. Rain-bearing winds come chiefly from the south and south-west, but heavy rain can at times be borne in on the area by the cold easterly wind which blows not infrequently. Winds from the north are typical nor'-westers, and such districts as Tuapeka West and Rongahere often receive rain when the remainder of the area is subjected to the unfavourable effects of dry nor'-westers.

The monthly distribution of rainfall over a 10-year period at Balclutha is shown in the following figures:—

	in.		in.		in.
Jan.	2.34	May	2.04	Sept.	1.90
Feb.	2.10	June	2.07	Oct.	2.35
Mar.	2.45	July	1.86	Nov.	2.44
Apr.	2.24	Aug.	1.81	Dec.	2.55

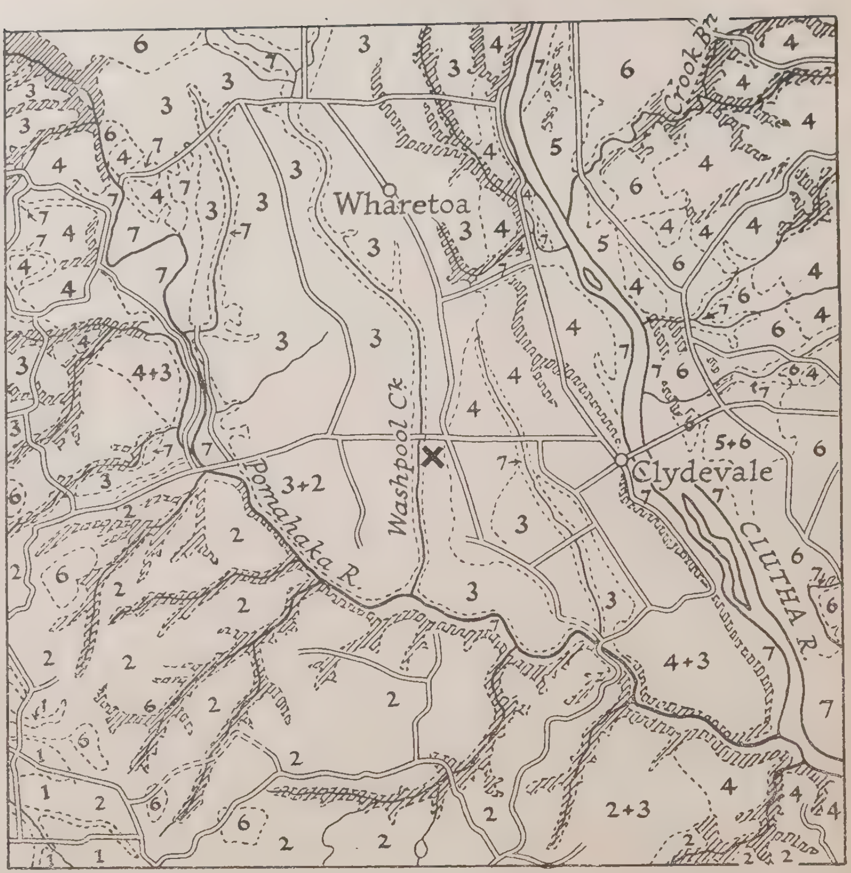
Balclutha has a mean yearly average rainfall of 26in., Milton 30in., Owaka 40in., Lawrence 30in., and Clinton 40in.

There are usually one or two light falls of snow a year, but on the lower altitudes these lie only a few days. Snow falling on the heights of the Blue Mountains in June and July often lies until October.

Soils

The soils of South Otago are silt loams which have been derived from wind-blown loess and which have developed according to aspect, slope of land, and the vegetative cover. The weathered mica schist of Central Otago, which forms the Inchclutha delta, is highly fertile. The silt which the south-west wind has for countless ages blown from the Clutha River on to the ridges on the northern side of the river has built up in these soils, comprising mainly the Greenfield and Pukeawa-Stony Creek regions, a slightly higher fertility than that of the other ridgy area.

Excluding the delta, the four main soil regions are: 1. On the north side of the Clutha River: Greenfield-Tuapeka Mouth and Pukeawa-Stony Creek-Awamangu districts, where areas of sharp land occur and where cocksfoot is dominant on the roadside. These soils are fairly free draining and do not offer great difficulty in working. (Soils 7 and 8 on accompanying soil map.) 2. On the south side: there the weathered mica schist is absent and drainage requires attention; browntop is the common roadside grass. This region includes the districts of Te Houka, Taumata, Popotunoa, Clifton, and Clydevale. (Soils 5 and 6.) 3. In the region of the Warepa Hills, where rainfall is higher. (Soils 3 and 4.) 4. In the Catlins area, where rainfall is high. Soil types in regions 1, 2, and 3 have mainly developed under tussock, whereas region 4 has developed from bush.



KEY TO SOIL MAP: 1. Warepa silt loam. 2. Te Houka silt loam. 3. Wharetoa complex, silt loams. 4, Clydevale silt loam and sandy loam. 5. Greenfield complex, very stony silt loam, etc. 6. Pukeawa complex, stony silt loam, etc. 7. Recent soils of river flats. shaded portions—Slopes too steep to plough. Location of farm marked X.

Balclutha-Clydevale Depression

Livestock farming is the main activity in South Otago, the average area sown in cereals having decreased greatly over the past few decades. The South Otago Freezing Company's works at Finegand are capable of handling up to 400,000 carcasses a year, and farmers in the district concentrate on products such as fat lambs, fat ewes, and wool.

The acreage of grass and clover seed saved has increased markedly over the past few years, due mainly to the ease of harvesting following the introduction of the header harvester. In the harvest of browntop seed this machine is very suitable, enabling a quicker harvest and cleaner sample to be obtained than under the older method of stripping.

With tractors replacing horses on many farms, the acreage of oats sown for chaff has decreased; there are still a number of horse teams employed, however.

The chief sources of farm income are:—

Fat lambs.

Store lambs.

Wool.

Surplus stock.

Grain and cereals. In recent years crops such as linen flax, mustard, peas, and turnip seed have been grown mainly on contract.

Small seed production.

Cattle from the bush area.

Dairy produce in the Delta region.

STATISTICAL DATA: SOUTH OTAGO (COMPRISING BRUCE, CLUTHA, AND TUAPEKA COUNTIES), 1943-44.

Total occupied area	1,633,071 acres
Number of holdings	2,617
Average area of holdings ..	624 acres
Area in sown grasses ..	566,676 acres
Area cut for seed, hay, and silage	17,265 acres
Area under annual crops ..	73,562 acres
Total cattle	43,017
Dairy cows in milk	11,732
Pigs	2,900
Horses	8,911
Sheep shorn	1,262,104
Lambs tailed	859,868

The reversion to browntop of pastures not sown down with good persistent strains of grasses and clovers and inadequately supplied with lime and phosphate is so complete that the native tussock is unable to re-establish itself.

The main area of the browntop harvest stretches from the Romahapa-Puerua districts to Waipahi and is bounded by the Clutha River and the Warepa Hills. It includes the districts of Te Houka, Clifton, Clinton, Taumata, Ashley Downs, Popotunoa, Waipahi, and Clydevale. Natural reversion to browntop also occurs on the rolling country above Lovell's Flat and in the Hillend and Pukekoma districts.

The farm reveiwed in this article is in the centre of what is termed the browntop area of South Otago. In its native state this area was clothed in tussocks (*Poa caespitosa* and *Danthonia raoulii*), which have now given way to browntop.

Browntop (*Agrostis tenuis*) is mat forming in habit, and as a pasture it produces very little feed compared with ryegrass and clover. Without adequate liming and topdressing pastures in this area rapidly revert to browntop. However undesirable this species is in a sward, its seed today has an appreciable market value. This seed, which is mainly exported, is used for lawns and playing fields and for inclusion in seeds mixtures for special purposes, such as on bush burns in unploughable country.

The harvest of the seed generally begins in mid-March and continues to July. It is usually carried out either by the header harvester or by the stripper. Yields depend on the vigour and density of the sward and range from 20lb. to 100lb. or more an acre.

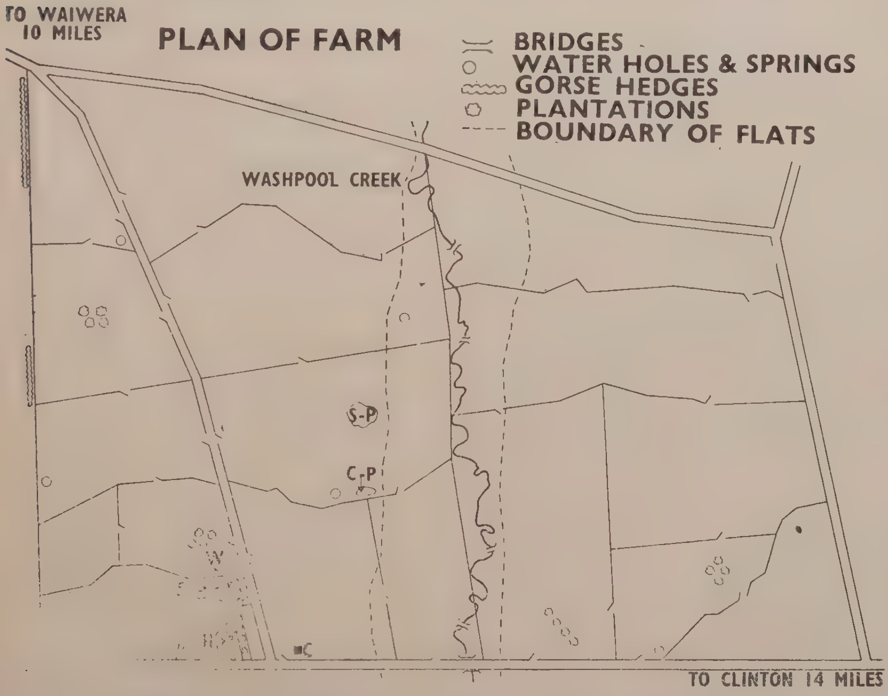
Contract harvesters usually gather the bulk of the seed, making arrangements with farmers either on a price basis or share basis, such as 50/50 or 60/40 (contractor gets 50 per cent. or 60 per cent. seed and the grower 50 per cent. or 40 per cent.).

The price of seed has been high over the past few years, as much as 4s. 4d. a pound being the selling price of the farmer to the merchant for machine-dressed Certified seed. The pre-war price was from 1s. 6d. to 2s. a pound. Browntop seed is certified free from red top (*Agrostis palustris*) under the Certification Scheme operated by the Department of Agriculture.

A SOUTH OTAGO FARM

That land in this district which naturally reverts to browntop can be maintained in good pasture and give returns payable to the farmer is well illustrated on Mr. A. V. King's farm of 1020 acres in the centre of the browntop belt; the returns indicate clearly what this land will produce under good management.

As in many other parts of New Zealand the original holdings in South Otago were large, and before 1900 the five chief stations were Clifton, Ashley Downs, Clydevale, Greenfield, and Begg's at Pukeawa. With the move for closer settlement division of these stations was undertaken, and with intensification of farming methods these small areas were able to support a farmer and his family. With the adoption of better farming methods, applied scientific practices, and the use of better strains of pasture plants, crop species, and livestock, these subdivisions are now themselves being further divided up into economic units.


PLAN OF FARM

H—Homestead. C—Teamster's cottage. S—Stables and implement shed. W—Woolshed. S-P—Shingle pit. C-P—Coal pit.

Mr. King's 1020 acres was originally a portion of the Clydevale Estate, and when taken over in 1910 by his father it consisted of four fields. Gorse was then very strongly established along the boundary fences.

The farm now consists of 18 fields. all of which have water available to stock; apart from two small gorse fences on the eastern boundary, the farm is free of this noxious weed.

With the exception of a few gullies, the steeper side of paddocks adjoining the Washpool Creek flats, and some swampy areas on the flat, the whole area is ploughable. Fields range from 16 acres to 114 acres, but the larger fields are gradually being subdivided and fenced with concrete posts made on the farm.

The number of shelter trees is not great; a good pine and macrocarpa plantation surrounds the homestead and there are a few small lines of developing macrocarpa in one or two fields.

Shelter generally on the browntop belt is poor, and extensive plantings of trees in the area for shelter would be beneficial. Mr. King has recently planted about 6 or 8 chains of poplar on the flats for wind shelter.

The soil is typical of the browntop belt. Without drainage, particularly mole drainage, the fields become very wet in the winter, which delays spring cultivation. In a dry spring a good deal of cultivation is required if desirable tilths are to be obtained. The soil is a silt loam with a fair percentage of clay and the soil profile of a virgin piece of land reveals ironstone nodules characteristic of impeded drainage. A typical soil profile is:—

6in. of grey silt loam; rusty fleck; firm crumb structure; slightly compact

10in. of mottled grey and yellowish-brown loam; "ironstone gravel;" mud compact

2in. of very gravelly layer of "ironstone concretions"

8in. of brownish-yellow silt clay loam; strongly compact underlain by yellowish silt loam of slight to moderate compaction.

Mr. King has fully realised the benefits of draining this class of soil.

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Farm buildings viewed from the house. Note shelter belts on windward side.

Drainage

The texture of the soil on this browntop area is suitable for mole drains which will function in it for a number of years. The whole area will benefit much from mole drainage; on an undrained paddock in which sheep are folded during winter on turnips, soil conditions can become extremely wet. In some parts surface water lies for weeks and rushes often appear.

All paddocks on Mr. King's farm have been mole drained, some as many as three times over the past 25 years. Mr. King considers extensive use of the mole plough "pays a handsome dividend," and his farm diary records its operation for as many as 10 days in a year. The plough is usually operated at 15in. deep, and the use of a spirit level on the plough enables drains to be kept on an even grade.

Use of the drain plough on this farm has improved the texture of the land and reduced the tendency of fields to poach, particularly in the winter with sheep on turnips. The farm flats through which Washpool Creek flows are subject to flooding, as the creek sometimes rises rapidly.

The use of the mole plough on this browntop belt is thoroughly recommended.

Water Supply

The farm is well supplied with water for stock and the household. There are water holes and springs in most fields and the Washpool Creek provides for stock in a number of paddocks. From a 60ft. well sunk in the depression beside the house water is piped to the farm house, farm buildings, yards, and dip.

Coal

The coal pit on Mr. King's property is probably an offshoot of one of the seams which in places form the bed of the Pomahaka River, which flows 3 miles west of the farm. The coal is a lignite which, if stored and dried for a few months, provides a very efficient fuel. Several farms bordering the Pomohaka River have coal deposits, and the Burning Plains derive their name from coal seams which became ignited during the burning off of tussocks in the early days.

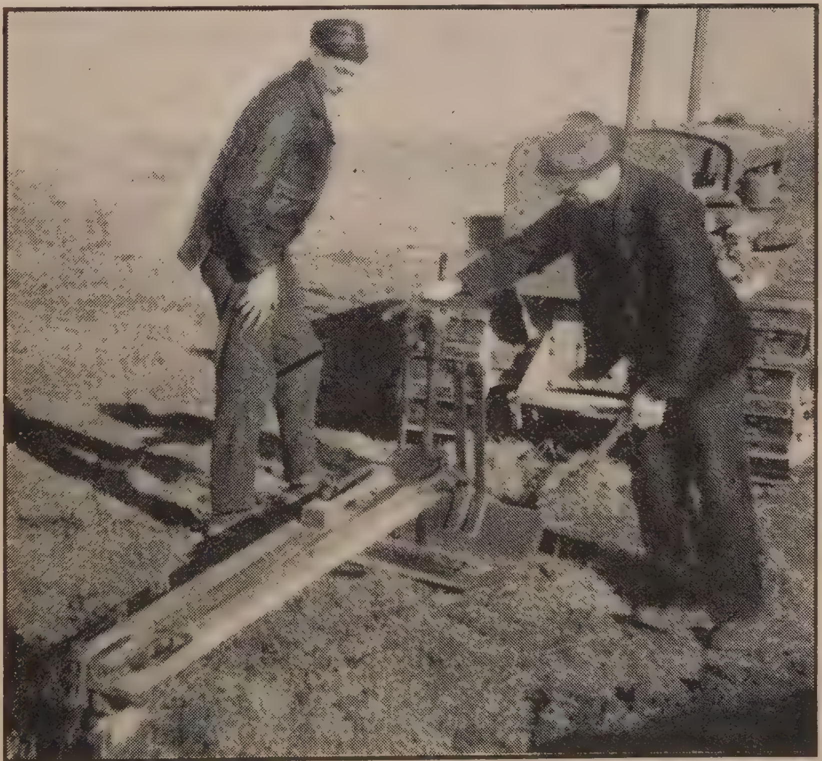
Farm Buildings

A constantly-recurring item in the farm diary is "general maintenance." The farm buildings, outhouses, fences, and sheepyards are in first-class order, and the general appearance of the farmyard is one of orderliness and good repair. All gates are five-barred wooden ones, well swung, and when fences (of 6 plain and 1 barbed wire) are renewed concrete posts made on the farm are used.

The farm buildings, at a convenient distance from the homestead and all with good drainage, consist of stable and implement sheds combined, woolshed, sheepyards, toolshed, single man's hut, pump house, and cowbyre. There is a substantial four-roomed house for the married teamster.

Farm Implements

Implements and machinery on the farm include a 32 h.p. track-laying



Mole drainage in the browntop area functions for many years and all paddocks on the farm reviewed have been mole drained.

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We Must Get Quicker Turnround

Journal of the British Grassland Society

[Editor: DR. H. I. MOORE]

This Journal is the medium through which British workers on grassland and related problems give the results of their experiments and their views and experiences on questions of current interest. It is designed to supply information of value and interest both to technical specialists and the practical farmer.

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1. Fifty Years' Work on Grassland at Cockle Park—H. C. Pawson.
2. Meadow Grass Silage on County Fermanagh Farms—T. Moore.
3. The Germination and Establishment of Red Clover under Conditions of Direct Reseeding—Watkin Williams.
4. Some Ecological Aspects of Hill Grazings in Scotland E. Wylie Fenton.
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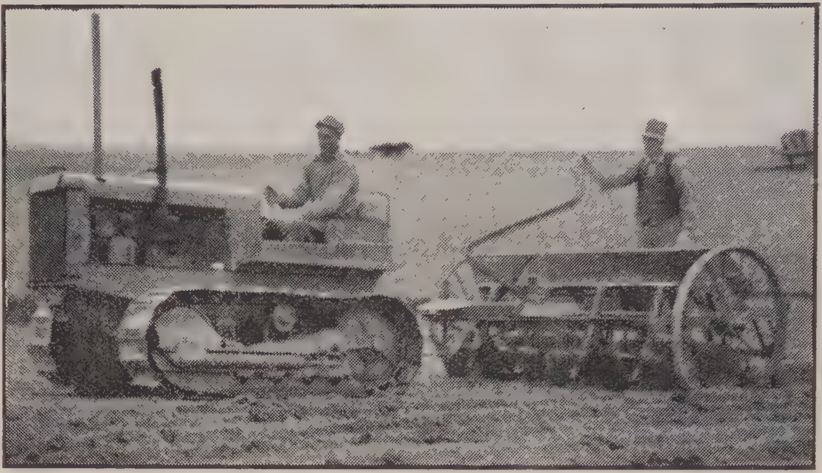
Livestock

Livestock as at March 31, 1946, included 200 stud Romney ewes, 78 stud Romney ewe lambs, 339 crossbred Romney flock two-tooths, 351 4-tooths, 570 6- and 8-tooth and over, 529 fattening ewes (cast for age), 9 wethers, 505 ewe lambs, 580 wether lambs, 52 ram lambs, 84 one-shear rams and over, 3 house cows, 1 6-horse team, a hack, and sheep dogs.

Cropping Programme 1946-47

The farm cropping programme for the 1946-47 season is as follows:—

Wheat, Cross 7, 22 acres
Oats, Gartons Onward, 25 acres
New grass, 63½ acres, some sown with soft turnips (Green Globe)
Kale, 10 acres
Swedes (Superlative), 80 acres
Rape (Broadleaf Essex), 45 acres
Grass seed, 6½ acres
Soft turnips, 23½ acres, comprising some Green Globe with grass and some Red Globe on kale or stubble land.


Most swede crops are ridged to allow the bulb to develop in a greater amount of tilled soil and to assist surface drainage.

Crop Rotations

Typical rotations adopted on the farm are as follows:—

1. Grass - turnips - rape - wheat-turnips and grass.
2. Grass - turnips - wheat - rape and grass.
3. Grass - linen flax - wheat - rape and grass.
4. Grass - turnips - mustard - wheat-rape and grass.
5. Grass - turnips - oats - rape and grass or turnips, followed by grass.
6. Grass - rape - wheat - turnips-oats - grass.

A young macrocarpa shelter belt developing well behind its adequate protection from stock.

Wheat

Cross 7 is the most popular wheat variety grown in South Otago because of its standing qualities, consistent yield, and good baking score. Average seasonal yields are as high as 45 bushels an acre, with individual yields not infrequently over 60 bushels. It can be either autumn or spring sown. In an endeavour to obtain crops ripening early so that they can be header harvested one or two growers are adopting autumn sowings, but these are the exception rather than the rule.

It is customary to sow after either swedes or turnips at the rate of about 2½ bushels an acre with 1cwt. of superphosphate or proprietary grain manure.

It is Mr. King's aim to have all wheat sown by the end of September, as in a normal season this enables the crop to be harvested in March. The reaper and binder are the most reliable means of harvest, and the crop after stooking is either stook threshed (if conditions are favourable) or stacked and threshed later in the season.

The header harvester is being used more frequently, but as is general with spring-sown crops in the south perfect heading weather is seldom experienced when the crop is mature, and as a result a good deal of wheat has been headed out of condition over the past few seasons. The moisture content of wheat for heading must not be higher than 15.5 per cent., and to give farmers a guide as to

the stage of their crop the Otago University, Dunedin, carries out moisture tests free of charge.

Oats

The most popular of the oat varieties sown is Gartons Onward, a good chaff and seed oat, which is spring sown. Although oats may follow wheat, its chief place in the rotation is after turnips or some other brassica crop. The seeding rate is from 3 to 3½ bushels an acre, sown preferably in September, with or without manure. If manure is sown, it is usually ¾cwt. of superphosphate, or a proprietary grain manure. February and March are the chief months of harvest.

Six and a-half acres of Gartons Onward sown on Mr. King's farm in 1945-46 and threshed in March yielded 112 bushels an acre.

Rape

The rape crop is a highly important one, for the farmer depends on it for fattening his lambs. It is general in the district either to sow alone in ridges or with grass on the flat. Mr. King prefers to sow alone, either on the ridge or on the flat, as when sown with grass a poor pasture sward results.

Broad Leaf Essex is the popular variety and the general rate of seeding is from 2 to 2½lb. an acre; ¼lb. of white mustard an acre is sometimes included for tonic purposes.

The rape crop may follow wheat, oats, or turnips, but is more frequently sown after the cereal crops.

Sown during November and December at intervals of two to three weeks in breaks of suitable size, the rape is usually ready for feeding off in the first week of February. A good crop of rape will fold 25 lambs an acre, and two areas totalling about 60 acres are usually sown on this farm.

Kale

The kale crop is invaluable during the late winter and early spring when grass growth may be late and turnips are required for the breeding ewes. About 10 acres a year are usually sown, the crop being used mainly as fodder for ram hoggets and fed off in breaks. Kale is somewhat clubroot resistant, and it is usual for it to follow swedes or turnips in the rotation. Sown on the first furrow after turnips, 10 acres in this season's cropping programme on Mr. King's farm is ridged in 24in. ridges and was sown about December 15 at 2lb. an acre, and should be ready for use during August, September, and October. The ability of this crop to hold over the winter is its chief attribute, and possibly more use of this crop could be made, particularly if disease continues to reduce yields of swede areas.

The Swede Crop

By far the most important single farm crop in Otago and Southland is the swede crop, for upon its success depends the ability to feed breeding ewes over the winter. In the south, with shorter grass-growing periods than in the north, the growing of root supplements such as swedes is absolutely necessary if stock are to be wintered well. Where soil and climatic conditions are too rigorous for swedes, soft turnips are substituted, and sheep are commonly folded on these crops in Otago and Southland during the winter.

Most swede crops are sown in 24 to 26in. ridges, the use of the ridge being favoured because it allows the bulb to develop in a greater volume of tilled soil and assists in the surface drainage of water in winter. As fields of swedes are generally fed off "in situ," severe poaching often occurs if good drainage is not available. Sowing in ridges also facilitates weed control in the early stages and thinning by hoe. The ridger can nearly always be used in these districts because there is seldom insufficient moisture for germination.

The sowing of the swede crop begins in early November and the rates of seeding vary according to circumstance. On clean ground Mr. King sows at 9oz. per acre and does not thin the crop, but if the area is inclined to be weedy, the seeding rate is increased to 14oz. per acre and the mechanical thinner is used.

General rates of seeding for swedes are as follows:—

26in. drills and not thinned	5 to 12oz. per acre
26in. drills and thinned ..	12 to 18oz. per acre

The general rates of seeding for yellow-fleshed turnips and softs are as follows:—

14in. rows (on flat) ..	6½ to 7oz. per acre
26in. ridges and not thinned	4 to 4½oz. per acre
26in. ridges and thinned ..	5½ to 6oz. per acre

Chief among the swede varieties used is Superlative, and the bulk of the seed which has been sown over the past few years has been that grown under supervision of and approved by the Department of Agriculture. This variety matures early and in the late stages of feeding off its quality and yield are often reduced by the incidence of dry rot.

The sowing of small acreages of late-maturing swedes, such as Resistant, will obviate loss of feed in late winter.

Other varieties grown in the district are Crimson King and Grandmaster. Sensation Swede, which is white fleshed, has been grown, but it is more suited to dry land conditions such as those of Canterbury. It might, however, find a use on the sharper land bordering the Clutha River.

It is customary to take swedes after lea, and on this browntop land swedes are almost invariably the first crop after the turf is turned under. With browntop lea, particularly if it is tough, early ploughing, preferably with a digger plough, is essential. The breaking nature of the digger leaves the upturned sods open to the frost and rain, which do much to break down and sweeten the soil and thus make spring cultivation easier. Early ploughing cannot be too strongly recommended.

Pasture Management and Establishment

The sowing of grass is mainly carried out from November until mid-March, either with rape, turnips, or alone. Sometimes a white crop, such as wheat, or mustard or linseed, is used as a cover crop.

It is essential that sowing take place on a well-prepared, weed-free, and firm seed-bed, so that the small seeds of grasses and clovers become well established before the winter. If sown late, clover establishment is poor and the pasture disappointing.

Typical mixtures sown by Mr. King over the past 2 years are as follows:—

	lb. per acre
Perennial ryegrass	35
Cocksfoot	9
Dogstail	2
White clover	4
Red clover	3
Total	53lb.

	lb. per acre
Perennial ryegrass	30
Cocksfoot	8
White clover	2
Alsyke	2
Red clover	2
Timothy	2
Total	46lb.

The following description of the botanical composition of a paddock of 16 acres which was sown down in 1940 should be typical of all 6-year-old swards in this area if they are drained, limed, and topdressed, and particularly if good seeds are used:—"Very tight sward which is dominantly perennial ryegrass and white clover with some cocksfoot, timothy, and volunteer dogstail. Weeds are few, but browntop is beginning to make its appearance."

The benefits of liming were realised very early by Mr. King, and the evidence of the sound

liming policy he has adopted is to be seen in his pastures, stock, and crops.

It has been customary to sow out pastures with 1 ton of lime and to follow up the next year with 6 to 8cwt. of lime plus 1 bag of superphosphate. In another 2 years (when the sward is 4 years old) another ½ ton of lime is applied. Under fertiliser rationing, however, it has been impossible to carry out this policy fully over the past few years.

The general rotation of the farm requires that swards be ploughed up every 7 to 9 years, and Mr. King finds that given the above treatment pastures will produce well over this period.

Grass seed is not harvested every season, but this year 6¼ acres of perennial ryegrass saved for seed required 10 balls of twine for tying.

Crossbreds are favoured on browntop country and above are some of the hoggets on the farm.

Management of Breeding Flock

Rams are dipped during January and if the season is late, flock ewes are shorn early in the month. Mr. King favours shearing his ewes during Christmas week. If sheep are dirty, dagging is carried out before shearing to obtain greater cleanliness of the clip and lessen the work of skirting. All shed work is usually finished by January.

Fattening ewes and cull ewes' lambs are attended to in February, lambs being weaned, crutched, and dipped and put with the ewes on to fresh grass before going on to rape. Rams for sale are drafted off and given special attention.

March is an extremely busy month with the flock, for the annual culling and dipping are carried out in preparation for mating. The local ewe fairs at Balclutha, Milton, and Clinton are held during this month.

In the past it was customary for Mr. King to take up to 25 per cent. of lambs fat off the mothers, but recently under the ruling weight and price schedules he has thought it advisable to hold his lambs. He does not sell any ewe lambs to the works, but they are later disposed of either for sale as hoggets or for sale as 2-tooths, or returned into his flock as replacements.

Ewes are culled for barrenness, failing mouths, or for unsatisfactory fleeces or frame.

During March Mr. King acquires his new rams for stud purposes so that he can breed his own flock rams.

Tupping begins in April with the stud ewes going to the ram early in the month and the flock ewes toward the end of the month. In 1946, 27 rams were placed out with 1260 ewes, and as tupping progressed a few additional fresh rams were introduced. During March, April, and May drafts of lambs are sent to the works and drenching is carried out periodically.

As pulpy kidney occurs in lambs in the district, Mr. King takes the precaution of vaccinating his ewes in July. The vaccine, which is injected into the flank, is an alum-precipitated entero toxaemic vaccine prepared in Australia.

From June to September fat ewes are disposed of to the Dunedin market, 425 being sent in 1946.

In 1946 lambing of the stud ewes commenced on September 9 and that of the flock ewes on September 23. The services of a shepherd are acquired at this time of the year, leaving the teamster and son free to attend to spring ploughing and cultivation, while Mr. King attends to the stud sheep. Shearing of rams and ram hoggets is carried out in September, which is the beginning of a particularly busy period on the farm.

Throughout October tailing is done; temporary tailing yards are erected in convenient paddocks, the knife being used. When tailing is completed the major sheep operation for the year still to be done is shearing. A beginning is made in December with the shearing of the dry sheep (ewe and wether hoggets). In 1946, 609 dry sheep were shorn. Flock shearing begins during the last week of December. Some wool yields are as follows:—

	Yields of wool	
Season	lb.	Sheep shorn
1934-35	15,938	
1935-36	16,157	
1944-45	18,622	1,881
1945-46	17,014	1,885
1946-47	20,600	2,052

Sales of Fat Stock

In 1946, 425 fat ewes were sent to the works and 496 wether lambs. In February of this year 109 wether lambs were drafted to the works off their mothers.

Conclusion

This review of farm practices on 1020 acres of land in the centre of the browntop belt of South Otago illustrates the potentialities of this rolling country. If the relatively large acreage of browntop-dominant land were fully developed, its contribution to the farming wealth of the area would be considerable. The majority of farmers within the area are conscious of the resources latent in their soil, and the huge increase in lime applied over the area and the adoption of better pasture species and farm methods are tending to increase the productivity of the area.

Acknowledgments

The writer is indebted to Mr. and Mrs. King for assistance and courtesies shown during the preparation of this article. Thanks are expressed to the Lands and Survey Department for the drawing of maps.

◆

Pig Broadcasts

UNDER the auspices of District Pig Councils broadcasts will be delivered in July as follows:—

Auckland—1YA, on July 16, at 7.15 p.m., "Equipment that Makes Pig Keeping Easy," by H. E. Clark, Supervisor, Auckland District Pig Council.

Wellington—2YA, on July 15, at 7.15 p.m., "The Freezing Industry," by I. H. Owtram, Supervisor, Taranaki District Pig Council.

Christchurch—3YA, on July 17, at 7.15 p.m., "Answers to Questions," by H. W. McIntosh, Supervisor, Canterbury District Pig Council.

◆

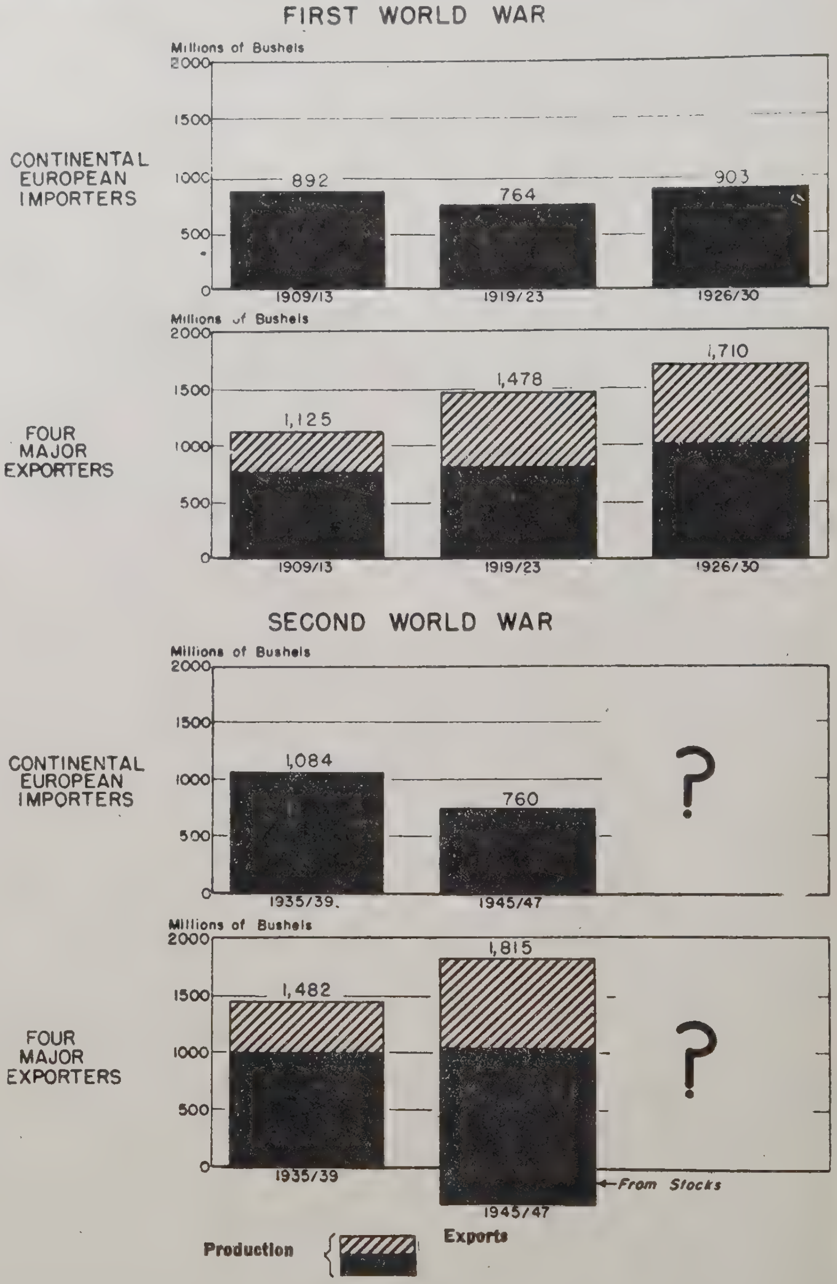
WORLD WHEAT PRODUCTION

AT present the world's wheat economy is greatly disorganised. Six years of war have brought about major changes in production and in the structure of the market. As shown in the accompanying diagrams, the statistical picture bears striking resemblance to that of the First World War and the period immediately after. There has been a large fall in production in Europe and a substantial increase in the New World. For the past two years the export surpluses of the major exporting countries, although substantially increased, have proved quite insufficient to offset the decrease in production elsewhere.

THERE are reasons for expecting the shortage of wheat to continue in 1947-48. The 1947 harvest, good in North America but poor in Europe, promises to be no better on the whole than that of 1946, and if the chief exporting countries retain for home consumption quantities equal to those they are consuming this year, little if any increase in export supply can be anticipated. On the demand side the predominating factor will be finance.

Part of U.S.A. and Britain

If the United States and Britain accept only limited responsibility for Germany and Japan and rations in those countries fall back again below the emergency subsistence level at which they now stand, and if other importing countries, because of foreign exchange difficulties, feel obliged to reduce imports and to diminish even their present meagre rations, it is conceivable that not all the 1947 wheat crop will find a market at present prices. On the other hand, if the United States of America and Britain decide to finance imports into Germany and Japan which would keep the normal consumer diet around 1500 to 1600 calories, and if the other wheat-importing countries decide to utilise part of their dwindling and limited foreign exchange resources for the purchase of wheat and other food because they feel it politically impossible to demand of their peoples further belt-tightening, the demand for wheat will almost certainly again exceed the available supply.



Future Prospects

Europe will unquestionably try to restore her agricultural production as quickly as possible. Some countries by 1948 may be growing enough bread grain to cover their essential needs. In others it may take a little longer. Most European Governments have to husband their foreign exchange resources carefully and from their point of view the sooner they can cease spending money on emergency food imports the sooner they will be able to devote their foreign exchange to the purchase of equipment and raw materials for the rehabilitation of their industries. Their financial position obliges them to become as self-supporting as possible in all things which they can reasonably produce. Thus when crop production recovers in the war-devastated countries, the food emergency period will be succeeded by a period of industrial rehabilitation.

Reprinted from Food and Agriculture Organisation of United Nations bulletin on wheat.

FARM WORK FOR JULY

By the Fields Division

CEREALS

Though farmers in some of the warmer soil types may sow wheat during July, it is not the accepted practice in most cereal-growing districts; sowings not made by the end of June are usually withheld until some time in August or later. It may happen, however, that weather conditions prevent extensive sowings of wheat in May or June and as a result a large area may be sown in July. The cultivation, the seeding rate per acre, and the fertiliser used would be similar to that for wheat sown in May or June.

In certain districts oats for a crop may be sown this month if weather conditions permit suitable cultivation of the ground. Gartons Abundance, Onward, Algerians, and Russets may be sown at this time of the year. Seeding rates will vary between 2 and 3 bushels an acre, the lighter sowing on lighter soils and a heavier sowing on heavier soils.

Malting barley may also be sown in certain districts if the ground has received suitable preparation. A rate of seeding slightly smaller than that for spring-sown barley may be used.

CULTIVATION

Initial cultivation for spring-sown crops can continue throughout the month. Soils benefit considerably from exposure to frosts and for this reason early ploughing is desirable. Frosts not only act as a cultivating agent, but improve the physical condition of the soil. If the land is being ploughed out of grass and contains twitch, the first operation is usually to skim plough. By skimming the twitch is kept near the surface and the quantity of it can be reduced before deep ploughing. Land free from twitch is frequently deep ploughed only. Rolling on the furrow tends to accelerate the rotting of the turf.

POTATOES

When weather conditions are suitable continue with the digging of the potato crop. Usually heavy frosts are experienced at this time of the year and it is advisable on frosty days not to commence digging until the frost has thawed sufficiently. Potatoes to be stored on farms should be amply protected from the weather, rain and frost being particularly harmful. Frequently in Canterbury a large quantity of potatoes is lost through frost damage, and the necessity of covering potatoes sufficiently cannot be too strongly stressed. Particular care should be taken to cover Certified lines of seed potatoes. If these become frosted, extreme difficulty is often experienced in removing all the frosted tubers.

PASTURE MANAGEMENT

With fertilisers still in short supply, the best use possible should be made of animal droppings. As opportunity permits pastures should be harrowed to spread the droppings evenly over the ground.

Growth on areas of perennial ryegrass, Italian ryegrass, or short-rotation ryegrass sown last autumn should not be allowed to become too rank before feeding off. Rank growth is readily fouled and when this occurs it tends to be neglected by stock. Furthermore, if the areas are intended for seed production, the development of rank growth is likely to have an adverse effect on seed yields.

When the ground is soft but not greasy on the surface heavy rollers may be employed to bury stones. Burying of the stones facilitates topdressing, cutting for hay, and harvesting of seed whether by direct heading or picking up from the windrow.

Liming.—Continue with liming as opportunity permits. If liming grassland, apply the lime to young grass paddocks which are not intended to be ploughed up for some years. The greatest direct response from lime is obtained in the form of increased clover growth. The lime encourages the growth of clovers and the clovers in turn assist the feeding of grasses. Best results from liming are therefore obtained when the lime is applied either to pastures which contain clover growth or to ones in which volunteer clover growth is likely to appear as a result of the liming. When lime is applied to pastures devoid of clover growth the results are frequently disappointing.

Grass-grub.—Many areas by now will probably show obvious signs of grass-grub attack. The damage can be partly rectified by rolling, which, though not likely to kill very many grubs, will pack the soil around the roots of the grasses and clovers and thereby tend to encourage rerooting. Encouraging stock to consolidate the ground by feeding out hay on affected patches will also assist in renewing the sward.

SUPPLEMENTARY FEED

As pasture growth in most districts is dormant at this time of the year, heavy supplementary feeding is usually necessary. On dairy farms feed out silage, mangolds, swedes, carrots, or hay, depending on the type of feed available. Drier parts of paddocks should be selected for feeding out to reduce pugging of the ground. For feeding out hay to sheep a rack made of sheep netting may be used to avoid undue wastage. Where stock are feeding off the growing crop make the breaks sufficiently small to enable the most economical use possible to be made of the feed. In seed-producing areas do not feed out grass and clover hay on areas intended for the production of grass seed.

SACKS AND BALING WIRE

In view of the acute shortage of sacks at present, wastage of sacks of all kinds should be avoided. All sacks on hand should be inspected and repairs made where possible. Rats and mice damage many sacks annually, so that wherever possible store sacks away from vermin. Baling wire is also in short supply. When feeding out baled hay to stock retain the wire for future use.

STOCK

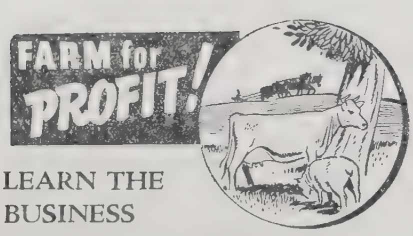
This is usually a bleak, cold month for stock and in parts of the country where the milking season is commencing cows that have newly calved should be carefully watched for the first signs of any of the troubles that go with parturition so that remedial treatment can be given without undue delay. All cows should be fed good-quality supplementary feed such as silage, mangolds, and hay.

Calves that are to be kept for replacements should be fed on whole milk for some time and then weaned gradually on to skim-milk and meat meal. A drinking bucket should be available for each calf and should be kept thoroughly clean by proper scalding periodically.

Lambing starts in some districts during this month and these early lambs will need extra care and should be kept in sheltered paddocks. Sheep feeding on root crops should be supplied with good-quality hay to balance the diet. Ewes, particularly those that will be lambing in four to six weeks, need extra feed to compensate for the accelerated growth of the foetus during this period.

Turnips and swede blocks should be of an area just sufficient to last the sheep between two and three weeks. Hoggets should be kept feeding ahead of the main flock to minimise the risk of parasitic infestation.

Attend to cutting hedges, cleaning drains, topping trees, and repairs to gates and fences.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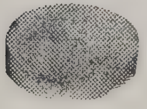

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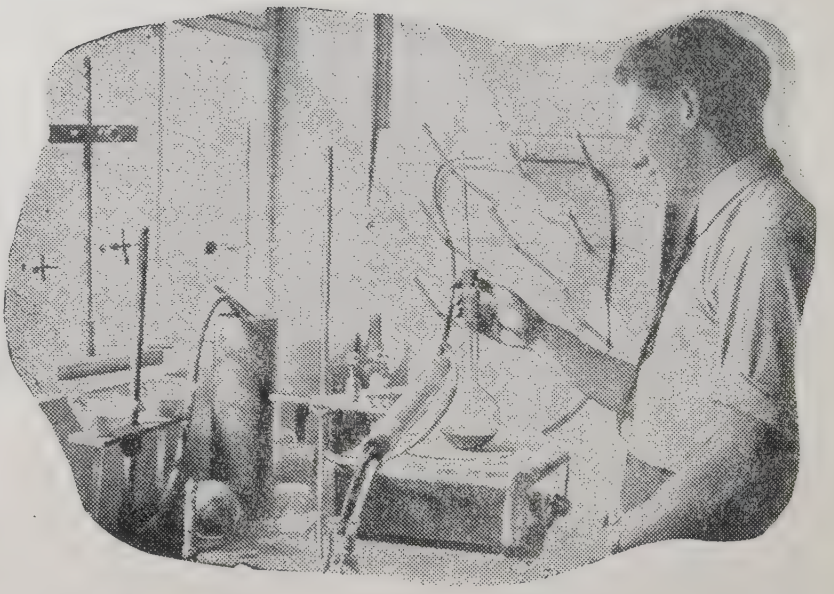

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THE HOME GARDEN IN JULY

By A. G. KENNELLY, *Instructor in Vegetable Culture, Christchurch.*

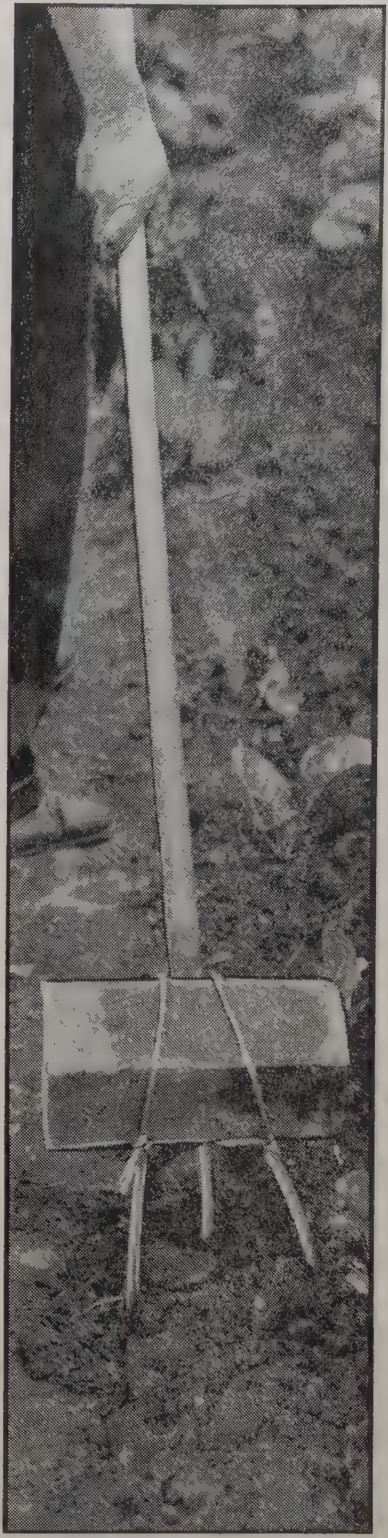
THE weather in July is seldom suitable for outside work and as the new gardening year has hardly commenced, the home gardener should take the opportunity of attending to odd jobs which could not be done in the busy season. Garden equipment and seed boxes, etc., can be checked over and any necessary repairs done. Soil for seed boxes can be sterilised, frames made, and the garden shed cleaned and tidied. Tools should be overhauled and shelves or cupboards can be built in the tool shed. Tools should be arranged so that they are easily found and are not likely to cause damage or injury.

ONE of the first steps in garden planning is to start a record of gardening activities. This can be kept in a notebook, and should be arranged under the following headings: Vegetable and Variety, When Sown, When Transplanted, Planting Distances, Crop it Followed, When Ready for Use, Yield, and Remarks (frost, manure, etc.). The data tabulated will be invaluable for future reference. At the beginning of each season a ground plan designed to avoid past mistakes should be carefully prepared so that maximum use is made of the ground. The position of each crop and the intended rotation can be shown. Here are some points which are worth bearing in mind when drawing up such a plan:—

1. A few straight rows are easier to plant and cultivate than a greater number of scattered short rows or beds, and needless waste of space for paths is avoided. When small quantities of seed are to be sown more than one kind of vegetable can be planted in the one row.
2. Plan for continuity and variety, giving special consideration to periods when vegetables are likely to be scarce and dear.
3. If the garden is on a slope, it is usually better to have the rows running across it than up and down.
4. Where possible avoid shading. Rows should run north and south rather than east and west.
5. Perennial crops such as asparagus and rhubarb should be planted where they will not interfere with winter digging or trenching.
6. Herbs such as garlic, chives, sage, and mint should be planted so that they are easily accessible to the housewife.
7. Do not crowd plants unless space is the primary consideration. Close inter-cropping is rarely as satisfactory as spacing that permits easy cultivation without danger of consolidation of the soil. Exceptions are the small, quick-maturing crops, such as radish, lettuce, and spinach, which may be planted during the early stages of widely-spaced crops such as tomatoes and brussels sprouts. If very close inter-row cropping is considered unavoidable, make use of the beneficial partnerships (symbiotic relationships) that are of proven worth. Examples are: Tomatoes and sweet corn; tomatoes and dwarf beans; potatoes and runner beans or dwarf peas; celery and leeks; cucumber and runner beans; spring onions and young carrots grown as a mixture; brassicas and French or dwarf beans; saladings such as spring onions, radish, and young carrots grown as a mixture; carrots, turnips, or beet and dwarf peas.
8. To avoid soil exhaustion and to keep diseases associated with it down to a minimum, practise correct rotation. For example, begin with taprooted crops (carrots, parsnips, etc.), follow with fibrous-rooted or leaf vegetables (cabbages, cauliflower, etc.), then tubers (potatoes and kumeras), and, finally, legumes (peas, beans, etc.). The order in which the four main groups follow each other is not very important, but the same group should not be cropped twice in succession with vegetables of any particular group. The leguminous crops, however, are soil improvers and fix nitrogen from the air in the nodules on their roots. They should therefore be used after any of the other groups whenever possible in the rotation.
9. Tall crops, such as sweet corn, brussels sprouts, and runner beans, which shade other crops and vegetables, such as pumpkin, melon, and marrow, which may overrun smaller crops should be placed where their development will not adversely affect other vegetables.

Planting Table

For most home gardeners a planting table is almost indispensable in planning a garden. The table on page 631 should provide a basis on which to work. It has been adapted from the Seed-sowing, Planting, and Harvesting Guide in "Vegetable Growing in the Home Garden," by D. K. Pritchard, which is available from all offices of the Department of Agriculture, price 6d., post free.



A brick tied securely to a tine cultivator saves hard work in making the tines penetrate deeply enough.

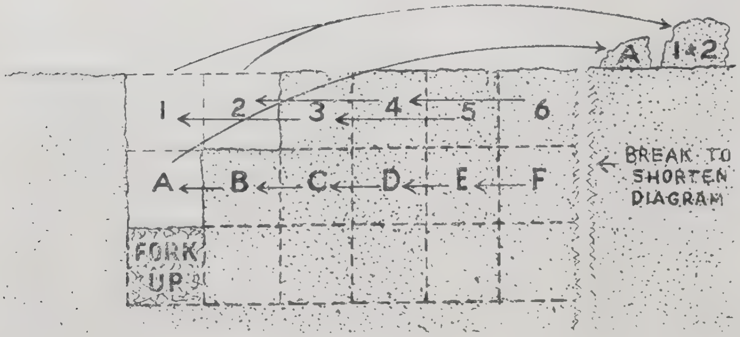


Fig. 1.

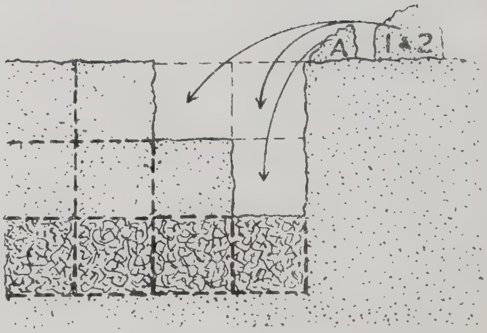


Fig. 2.

Proper method of trenching three spits deep.

Fig. 1 (left)—The soil is dug so that each layer remains at its respective level.

Fig. 2 (right)—The way to finish off.

Cultivation

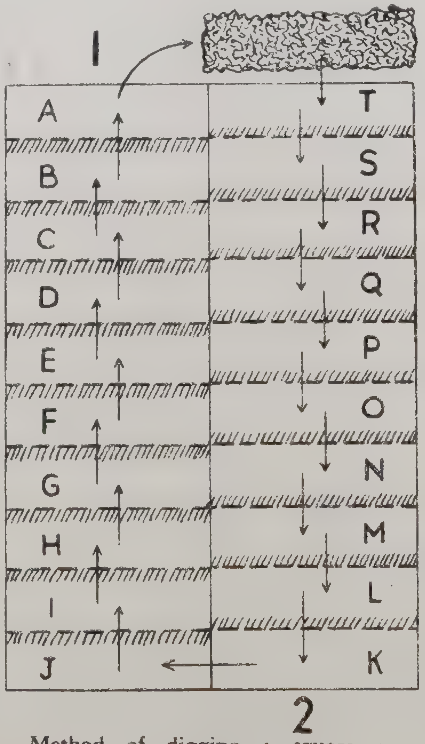
The successful commercial gardener realises the necessity for thorough cultivation and he knows that in unsettled weather it may be necessary to repeat all his cultivation—ploughing, discing, harrowing, and rolling—several times before he is able to sow. On the other hand, few home gardeners appreciate the supreme importance of thorough cultivation, though it is one of the most fundamental of all garden practices. Some of its advantages are:—

1. It improves aeration and thus tends to improve soil temperatures. By allowing the water to drain more quickly from the highly-fertile top layer of soil it prevents it from getting sodden and sour.
2. It mixes the organic and inorganic matter in the soil, and thus provides better opportunity for the beneficial soil bacteria to function.
3. It allows garden rubbish and persistent garden weeds to be disposed of and humus or humus-forming materials to be incorporated into the soil.
4. It provides a deeper rooting medium for plants and enables them to reach water more easily in dry weather.

For the home gardener there are three methods (apart from surface cultivation such as hoeing) by which an area may be cultivated. It may be simply dug or forked over one spit deep. This is satisfactory on well-drained land or on land that has been deeply dug during the past two years. It may be double dug—that is, cultivated to a depth of two spits—a practice also known as mock or bastard trenching, and although not so effective as full trenching, this is the most commonly-practised method and gives excellent results. Finally, there is full trenching, a laborious operation in which the ground is cultivated to a depth of three spits.

Figs. 1, 2, and 3 show the method of trenching. Soil is first excavated from 1, 2, and A (Fig. 1), the surface and subsoil being separately heaped where it is intended to finish. The bottom or third spit is then forked over and B is thrown into A; 3 is then dug over into 1 and C moved into B; 4 is moved to 2 and the whole process is then repeated by moving D to C, 5 to 3, and 6 to 4. Finally, Fig. 2 shows the method by which the work is completed. If wide enough, the plot is best divided as shown in the diagram on the left. Narrow plots are usually dug over the full width and the soil deposited at the finishing point as shown in Figs. 1, 2, and 3.

The diagram on the left shows how an area of ground is dug. Soil is first removed one spit deep from A and heaped, as shown, parallel to T. The worker, facing 1, excavates B, filling A with the soil. Continuing, he excavates C into B, and so on until J is dug out. K is then put into J, and L into K. The process is repeated with the worker facing 2 until T is excavated and is finally filled with the soil from A. If the ground is being double dug, the trench must be wide enough to permit the subsoil to be forked up.



Method of digging a square or rectangular plot.

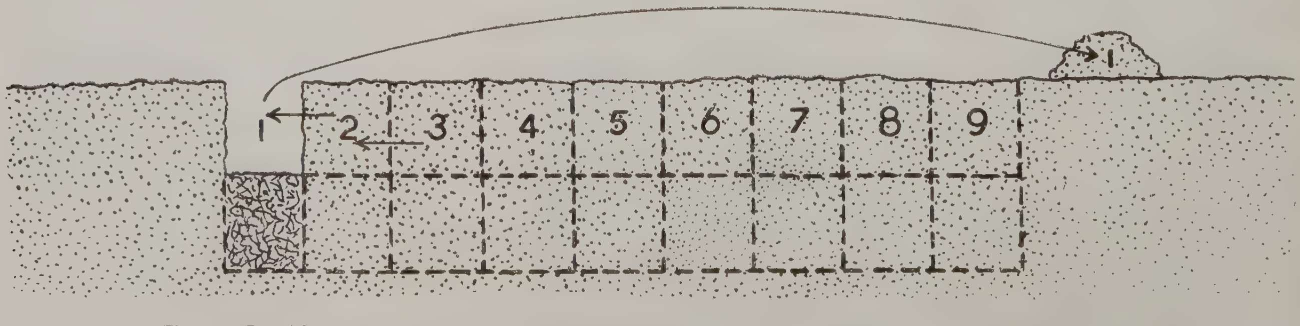


Fig. 3—Double digging or mock trenching. The second spit is forked over, but not removed.

PLANTING TABLE FOR HOME GARDENERS

Vegetable	Feet of Row per Person in Household	Probable yield of 100ft. of Row	Seed Required to Plant 100ft. of Row	Hardiness	Distance between rows	Distance between plants in rows	Days to Maturity
Asparagus	5 – 10	50lb.	1oz.	very hardy	36–60in.	18–24in.	Root 2–3 years
Broad Beans	5 – 10	150–200lb.	1 quart	hardy	24–36in.	4–6in.	90–120
Other Beans ..	5 – 15	60–80lb.	½lb.	tender	24–48in.	4–6in.	50–90
Beetroot	10 – 15	100lb.	1oz.	hardy	12–27in.	2–3in.	50–70
Brussels Sprouts	5 – 10	25–40lb.	¼oz.	very hardy	24–36in.	18–24in.	90–120
Broccoli	5 – 10 for early, mid & late varieties	45–55 heads	¼oz.	very hardy	24–36in.	18–24in.	140–190
Cabbage	5 – 10 for early, main and winter varieties	150–200lb.	¼oz.	hardy	24–36in.	12-24in.	90–120
Cauliflower	5 – 10 for early and main varieties	45–55 heads	¼oz.	hardy	24–36in.	18–24in.	85–120
Carrot	10 – 20	75–100lb.	¼oz.	hardy	12–27in.	3–4in.	80–120
Celery	10 – 15	100–200 heads	⅛oz.	hardy	12-48in.	6–12in.	120–180
Cucumbers	5 – 10	80–100lb.	½oz.	tender	48 hills	48 hills	85–120
Kumera	75 – 200	140–200lb.	75 slips	tender	24–30in.	16–18in.	140–160
Leeks	5 – 10	150–200 plants	½oz.	hardy	12–36in.	6in.	120
Lettuce	5 – 10	100 heads	¼oz.	hardy	12–27in.	8–12in.	60–85
Melons	10 – 15	120–150lb.	½oz.	tender	48–72 hills	48–72 hills	120–150
Marrow	5 – 10	Variable	½oz.	tender	48 hills	48 hills	120–150
Onions	5 – 10	100–150lb.	½oz.	hardy	12–24in.	3–4in.	100–150
Pumpkin and Squash	5 – 10	Variable	1oz.	tender	72 hills	72 hills	90–120
Parsnips	5 – 15	160–220lb.	½oz.	hardy	12–27in.	4–8in.	85–150
Peas	10 – 25	120–160lb.	1lb.	hardy	20–36in.	2–3in.	60–90
Potatoes	75 – 200	150–200lb.	16-20lb.	tender	24–27in.	14–16in.	120–150
Radish	3 – 4	400–500 plants	1oz.	hardy	12in.	2in.	25–40
Rhubarb	3 – 6	50–70 roots	1oz.	hardy	24–48in.	24-48in.	1–2 years
Shallots	5 – 10	20–25lb.	12–15lb.	hardy	12in.	8in.	5–6 months
Spinach	10 – 30	50–80lb.	1oz.	hardy	12-24in.	3–6in.	50–70
Silver Beet	5 – 15	80–150lb.	1oz.	hardy	15–27in.	8–12in.	80–100
Swedes	5 – 10	200–300lb.	¼oz.	very hardy	12–27in.	6in.	90–120
Turnips	5 – 10	75–100lb.	¼oz.	hardy	12–27in.	3–4in.	60–80
Tomatoes	15 – 30	250–300lb.	66–80 plants	tender	36–54in.	12–24in.	150–170

The accompanying table showing family food requirements (quoted by Professor C. H. Nissley, of the New Jersey Agricultural Station, in his "Pocket Book of Vegetable Gardening") is recommended by food authorities for winter as well as summer, and may be used in conjunction with the planting table.

FAMILY FOOD REQUIREMENTS

Vegetable	Amounts	Approximate yearly amounts for family of five
Potatoes (sweet or white)	One or two servings daily	10-15 bushels
Tomatoes, citrus, or any raw vegetables or fruit	One serving daily	390-520lb.
Yellow, green, or leafy vegetables	One serving daily	520-910lb.
Other vegetables	One serving daily	390-780lb.
Dried peas or beans	One or two servings weekly	65-130lb.

(Reprinted from Extension Bulletin No. 34, "Home Vegetable Gardening," University of Delaware, Newark, Delaware, March, 1941.)

General Work

The work of digging over or trenching vacant ground, turning in green crops, and gathering garden trash such as leaves and decaying vegetable matter for use in the compost heap should be proceeded with. Woody garden materials not suited to composting should be burnt and the wood ash stored in a dry place until required. Wood ash obtained from burning old wood has a potash content of up to about 10 per cent. and that obtained from the burning of green wood considerably more. Potash is of considerable value in the production of onions and tomatoes.

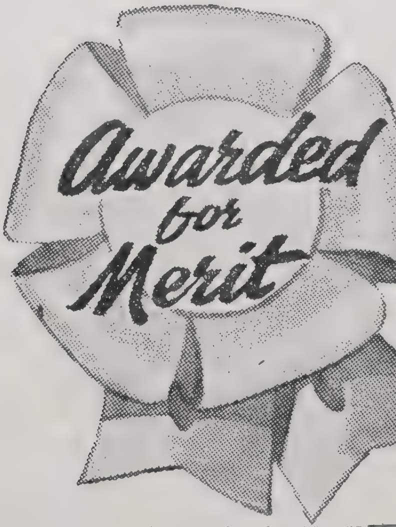
Garden Hygiene

Another important reason for burning old woody material such as old casewood, posts, and stakes is that it frequently carries over fungus diseases such as silver leaf disease (*Stereum purpureum* Pers.) and coral spot (*Nectria cinnabarina*) which attack and cause the death of many ornamental, timber, and fruit trees. The coral spot fungus is often thought to be a saprophyte and in many instances it is, covering dead wood with its bright coral- or orange-coloured spots. But in other instances it is a true wound parasite which attacks various forest and small fruit trees. Silver leaf disease, the fructifications of which are usually flat, circular or semi-circular discs sometimes seen growing out at right angles to an affected tree, has a very wide range of hosts, including pip, stone, and small fruits, and ornamental trees and shrubs. The first sign of an attack is an even silvering of the foliage; plants decline in vigour and branches die.

There is no cure for either of these diseases, but if they are detected soon enough, cutting out affected branches may arrest their spread. Tools used in this operation should be dipped in a good disinfectant before being used again, and the wounds should be treated with some suitable preparation, such as Bordeaux paste, or acidulated mercuric chloride.

Seed Sowing

Caution should still be exercised in sowing and planting. The end of the month is sufficiently early in most districts for such work, although seed sowing is not a matter to be determined by the calendar. Climatic conditions and the state of the ground are factors equally to be considered. The expert's success in seed sowing is usually a source of envy to his less successful neighbours, who often ascribe it to luck or chance. It is neither of these, but just a little applied knowledge which enables him to appreciate the requirements of plant life. The novice may take it as a general rule that the soil is much too wet for sowing if it sticks to the soles of the boots when it is walked on. It is impossible to avoid lumpiness in soil that is wet, and the air spaces in it, no matter how well it is cultivated, are likely to prove fatal to the sensitive roots of germinating seed. If the soil is gently firmed to eliminate the air pockets, it usually consolidates to a degree inhibitive to development. Light or medium soils dry out more quickly and afford more opportunities



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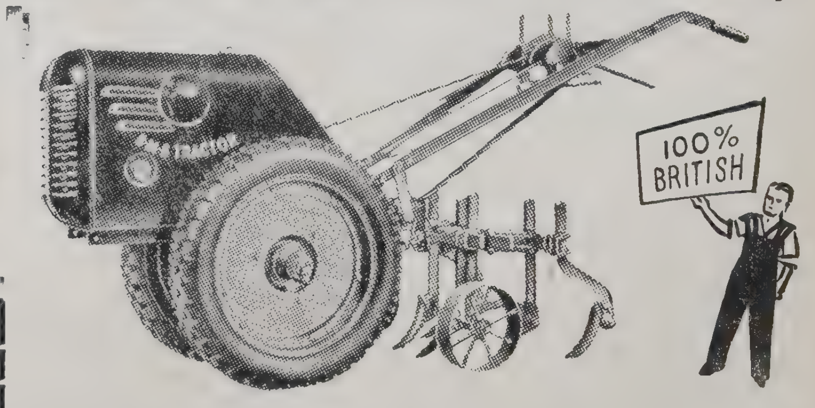

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for sowing than heavy soils, and in gardens where the soil is heavy a specially-constructed seed-bed made of soil containing a high percentage of sand is an advantage. A movable frame built over it will add further to its utility.

Seed Dressings

During the coldest period of the year it is advisable to dress seed with a suitable seed protector before sowing. For pea and lettuce seed red or yellow copper oxide or copper carbonate in finely-powdered form is suitable. Quarter of an ounce is sufficient for 5lb. of pea seed. The powder is put in a tin partly filled with, say, ½lb. of pea seed and the whole shaken so that the seed is thoroughly covered. The tin is then tapped gently so that the excess powder falls to the bottom, the peas are removed, and the operation repeated with another lot. Do not treat brassica seed with these chemicals, or damage to germination may follow. For beetroot, carrot, parsnip, lettuce, and spinach a seed dressing of zinc oxide should be used. All these chemicals are obtainable from a chemist. There are also a number of effective proprietary seed dressings obtainable from most seedsmen or horticultural firms. The directions set out by the manufacturer should be closely followed.

SOWING AND PLANTING

Asparagus

In the North Island asparagus beds are usually planted in August, but where the ground is in good condition and reasonably dry it is possible to plant toward the end of July. One-year-old seedlings are preferred. The crowns are set about 8in. below soil level and may be planted in double rows 18in. apart each way, but if planted 18in. apart in a single row, the beds usually give quite a satisfactory return. The bed should be at least 42 to 48in. wide and in districts where planting cannot yet be done its site should be kept cultivated and free from weeds. Well-rotted stable or farmyard manure can be worked into the bottom spit and if necessary, the ground can be drained. Good varieties to plant are Mary Washington, Martha Washington, and Conovers Colossal.

Broad Beans

Though broad beans are usually grown as a late spring or early summer vegetable owing to their liability when grown later to black aphis attack and the risk of damage to their flowers by bees, a sowing made during the early part of July should do well and provide a welcome addition to early summer menus. The broad bean prefers a heavy soil that does not dry out. Sow 2 to 3in. deep in double rows with the beans zig-zagged 4in. apart and the rows 3ft. apart. A quart of beans will sow 100ft. of row.

Should the plants become infested with black aphis toward harvesting time, spray with nicotine sulphate 1:800 parts of water and soap (6 teaspoonfuls of nicotine sulphate and 2oz. of soft soap to 4 gallons of water) and pinch out the tender, growing tips.

Cabbage

In the north seed of Golden Acre cabbage should be sown in mid-July and in the south a little earlier. A warm, sheltered situation with favourable soil conditions is necessary and where these conditions are lacking it is advisable to use a cold frame. Sow in boxes containing 5 to 6in. depth of light, open-textured soil so that when the young plants are sufficiently forward they can be easily removed from the frame and hardened off. Conditions should be such that the seed germinates promptly and the young plants are kept growing without check. They should be thinned if crowded, as the desired type of seedling for transplanting is one with well-developed roots and strong rather stocky stem and leaf growth.

Spring Cabbage

Continue to cultivate spring cabbage and apply liquid manure if the plants are not making much growth. The application of nitrate of soda or sulphate of ammonia at the rate of 1oz. to 4 gallons of water will stimulate growth. In the south home gardeners can follow the practice often adopted by commercial growers on the less sheltered or main crop class of land, and plant out the Flower of Spring or pointed type of cabbage during the early part of the month. If sturdy plants are set out, the crop often reaches maturity little later than crops planted earlier on similar land.

Carrots, Beetroot, and Turnips

Small early sowings of carrots, beetroot, and turnips should be made at the first favourable opportunity. For first of successional sowings varieties of carrot such as Early Krop, Market Garden, and Early Short Horn are suitable, and varieties of turnip such as Early White Milan and White Stone are good. Most turnip-rooted varieties of beet are suitable for early sowing.

Sow the seed of all these vegetables ½in. deep and in rows 12in. apart. The beetroot and turnip should be thinned to 3 to 4in. apart in the rows, but the carrots may be left, and the thinnings used when large enough for soups and stews. Turnip tops are very nutritious and may be used in a similar manner to spinach. For carrots and turnips superphosphate broadcast at the rate of 2oz. a square yard and for beetroot a mixture of blood and bone mixed with twice its weight of superphosphate and broadcast at the rate of 3oz. a square yard will be found to give good results. A dressing of dry wood ashes, if obtainable, may also be broadcast and raked in before sowing the crops.

Lettuce

If not yet done, a sowing of lettuce should be made outside as soon as conditions are favourable, or, alternatively, the seed can be sown in boxes of light, free soil in a frame. Varieties such as Success and Webb's Wonderful (Neapolitan) are suitable for sowing now. Grown under good conditions, most lettuce mature about 13 weeks after sowing, but both varietal and environmental factors may cause variation of this period. Sow ¼in. deep in rows at least 12in. apart. Thin to 8 to 12in. apart when the seedlings are well established. Light sandy or loamy soils are preferred at this time of the year, but for the best results the soil should be rich in organic matter. Blood and bone manure at the rate of ¼lb. a square yard broadcast after digging and before sowing or planting should give satisfactory results. This can be supplemented with nitrate of soda hoed in between the rows at the rate of 1oz. a square yard. Do not allow the nitrate of soda to come in contact with the plants. Weekly applications of liquid animal manure may be substituted for the nitrate of soda.

Onions

In the north onion plants from autumn-sown seed may be set out toward the end of the month in rows 12in. apart with the plants 3 to 4in. apart in the rows, and in the south, where it is customary to spring sow main crop onions, a small early sowing, provided weather and ground conditions are favourable, may be made. The onion bed should have been thoroughly cultivated and preferably have been manured in the autumn with well-rotted stable or farmyard manure. A dressing of bonedust broadcast at the rate of 3 to 4oz. a square yard plus superphosphate at the rate of 2oz. a square yard and potash 1oz. a square yard is recommended. A heavy dressing of wood ash is a good substitute for the potash. The bonedust is best applied 2 to 4 weeks before planting. The onion requires a firm bed, and where the soil is light good consolidation is desirable. Heavy soils require less consolidation owing to their tendency to set even more firmly than is desirable after heavy rain. Pukekohe and Turbot are good varieties for long keeping.

Potatoes

Continue to sort over potatoes to eliminate rots, and set suitably-sized tubers to sprout and green as de-

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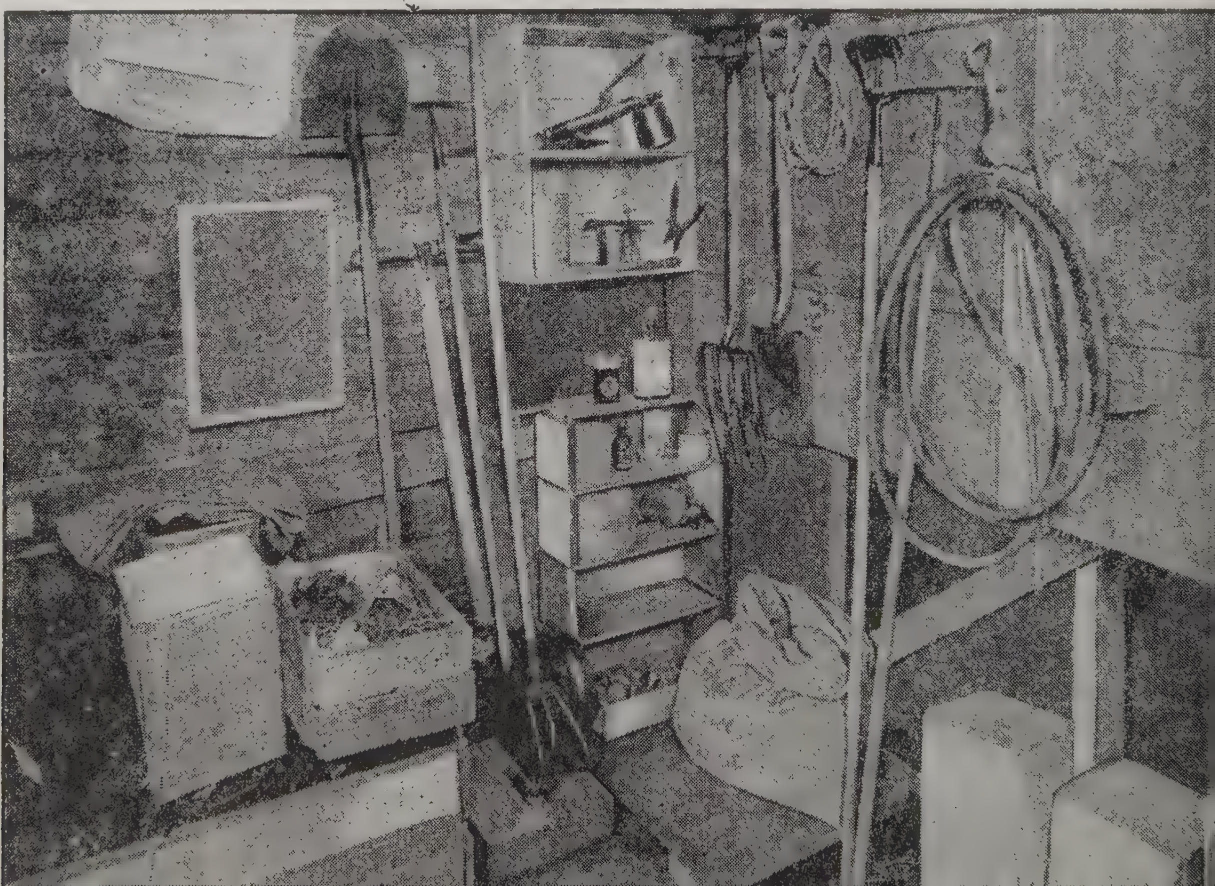
In winter, when little outside gardening is possible, opportunity should be taken to attend to odd jobs in the garden shed. Tools can be sharpened and polished, or wiped over with an oily rag or brush. Shelves and cupboards can be built, or if timber is lacking, boxes can be nailed high on the wall. Tools hung on nails in the wall are more readily accessible and less likely to cause damage or injury than if stood against the wall or thrown into a corner. The lawnmower and spraying outfit can be checked over and any necessary repairs and adjustments made so that all equipment is in order for the next season.



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scribed in last month's "Journal." Plantings can be made in well-drained soil in sunny and relatively frost-free areas, but no general early planting should yet be made. Small lots of potatoes stored for culinary use should be protected from the depredations of the tuber moth, if the presence of this is known or suspected. A light dusting of burnt or hydrated lime will give some measure of protection to the "eyes" of uninfested potatoes. Where infestation is too well established for picking over to be effective, fumigation with carbon bisulphide can be used. Place the potatoes in a tin, washhouse copper, or similar container that can be made practically air tight, and put the sack later to be used for storing on top of them. Pour on it carbon bisulphide at the rate of 1 fluid ounce to each 14 cubic feet of the container. Close the lid and make it as air-tight as possible and leave for 48 hours. If the carbon bisulphide is used at greater strength, damage to the tubers will result. The vapour is highly inflammable and must be used with caution. A light dusting of arsenate of lead powder may be used to protect seed potatoes while they are sprouting. The tuber moth caterpillar is pinkish or greenish in colour, and is up to ½in. long. Its dirty-coloured burrowings in the tubers are easily recognised.

Peas

Though the pea is a hardy vegetable, home gardeners often fail with early sowings. In cold, wet soil the young plants can grow only slowly and usually become so weakened that they fall easy victims to the attacks of the weakly parasitic soil fungi which are present in most unsterilised soils but which rarely trouble vigorous-growing plants. No advantage is therefore to be gained by early sowing unless conditions are suitable, but where they are, sowing may be made in most northerly districts this month. In the south, except where conditions are especially favourable, it is better to delay until August or later.

Peas repay good cultural methods and the ground should be deeply dug and of high humus content. When sowing make a shallow trench and in the bottom of it press the seed into the heavier soils 1in. deep and up to 2in. deep in light soil. The seed can be sown in zig-zag fashion 2 to 3in. apart in rows which can be 20 to 36in. apart according to the vigour and height of the variety. Vigorous varieties grown in good soil will often do better thinned to 4 to 6in. apart. One pound of seed is sufficient for about 100ft. of row. William Massey is probably the most popular of the early varieties.

Radish

Early radish may be grown in most gardens from a sowing made toward the end of the month. The bed should be well drained and of light friable soil, rich in humus. Drainage can be improved by deep initial cultivation and by the use of raised beds. If the seed is to be broadcast on beds, the home gardener must ensure when making them that they are easily accessible for harvesting from the side.

Rhubarb

If not already done, the rhubarb beds, both established and in process of construction, should be cleared of weeds and manured as described in last month's "Journal." If crowns have been lifted and laid aside to await the development of "buds" before division for replanting, they should be examined from time to time so that when ready they can be divided and replanted without delay. Rhubarb may be quite simply forced in any situation where there is moderate warmth. As a rule early varieties are chosen and forced by being covered with straw or with a box such as a good-sized petrol case so that the frosts and to some extent the extreme cold are excluded. The covering can be removed on warm, sunny days.

Silver Beet and Spinach Beet

Silver beet is sometimes referred to as Swiss chard and the two for all practical purposes are synonomous. Spinach beet, though differing somewhat in habit, is also in the same category. An early sowing of this class of vegetable may now be made in sheltered gardens if the soil conditions are favourable, or alternatively, a sowing made in a specially-sheltered prepared bed or in a frame will provide plants for setting out later. The area to be used for the crop will benefit by the application of a manure made up by mixing 3 parts of superphosphate and 1 part of sulphate of ammonia and broadcast at the rate of 2oz. a square yard. Sow the seed ½in. deep in rows 15 to 27in. apart.

Spinach

Spinach is a cool weather vegetable and is usually one of the first subjects for early spring sowing. It grows quite well in the relatively-low earth temperatures of early spring, provided the ground has been well cultivated and drainage is good. It will not tolerate acid soil conditions and if lime has not recently been applied, a dressing of 3 to 4oz. to the square yard should be worked into the ground before sowing. The crop is best forced along quickly and should reach maturity in from 6 to 10 weeks. For rapid and succulent growth a dressing made up (by weight) of 1 part sulphate of ammonia and 3 parts superphosphate should be broadcast at the rate of 3oz. a square yard after digging. Sow the seed 1in. deep in rows 12in. apart.

LIME

Though lime may be applied to the soil at any time of the year, July is especially suitable because so much ground is then either vacant or in preparation for the new season's crop. The home gardener is often confused by the multiplicity of the kinds of lime quoted by authorities, and though all the varieties used for agricultural purposes are usually classified into about six main groups, the horticulturist or home gardener need be concerned only with burnt lime, hydrated lime, and carbonate of lime.

Burnt Lime

Burnt lime, sometimes called caustic, quick, or builder's lime, consists chiefly of lime in the form of calcium oxide and is produced by burning limestone or chalk in kilns. It is said to be "slaked" when it has taken up moisture. It is difficult to store because of its caustic properties and must not be allowed to come in contact with vegetation. Its great value lies in its application to heavy soils. It splits up the soil particles, flocculates heavy clays, and tends to make the ground more open. Burnt or quick lime will free the ammonia in sulphate of ammonia and dung if allowed to come in contact with it, and should therefore be applied some time before the application of the manure. It should never be used on loose, light soils because of its tendency to destroy what little humus there is.

Hydrated Lime

Hydrated lime is obtained by treating burnt or quick lime with water. Owing to the addition of water, the calcium oxide content is less than in the quick lime from which the hydrate is obtained. It stores well, is easy to handle, and is readily soluble, and as it is harmless to growing plants, it may be applied at any time of the year. It is probably the best type of lime for use in the average home garden. If seed is to be sown, however, the lime should be applied at least 10 to 14 days before, as otherwise it would tend to interfere with germination.

Carbonate of Lime

Carbonate of lime (the natural form of limestone or chalk) consists of calcium oxide combined with carbonic acid and mineral impurities, and on a comparative basis 1½lb. is about equal to 1lb. of hydrated lime. Its use is preferable to hydrated lime on light soils because, being less soluble, it does not wash out of the ground so easily. It has all the virtues of hydrated lime and in addition has no adverse effect on germination. Unlike quick lime, it does not decrease the small content of humus in light soils.

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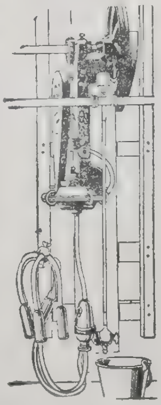

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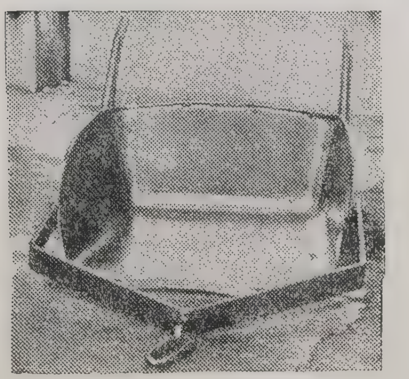

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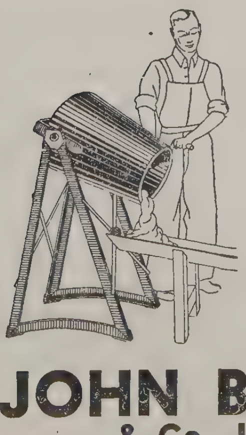

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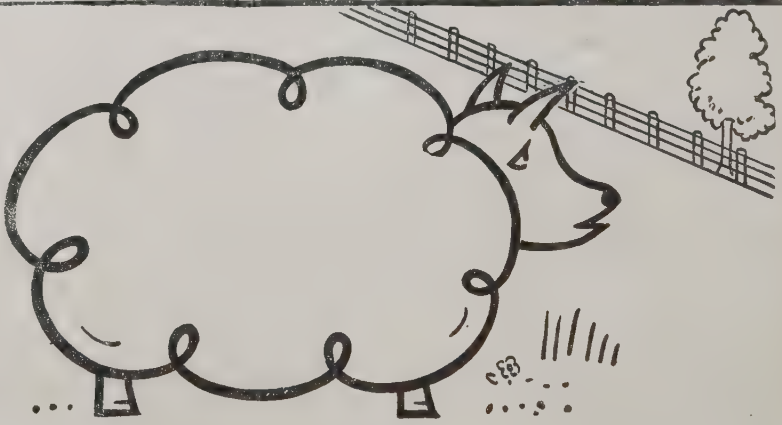

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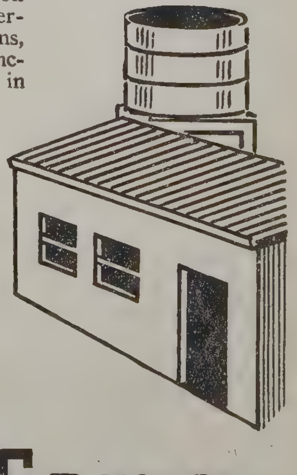

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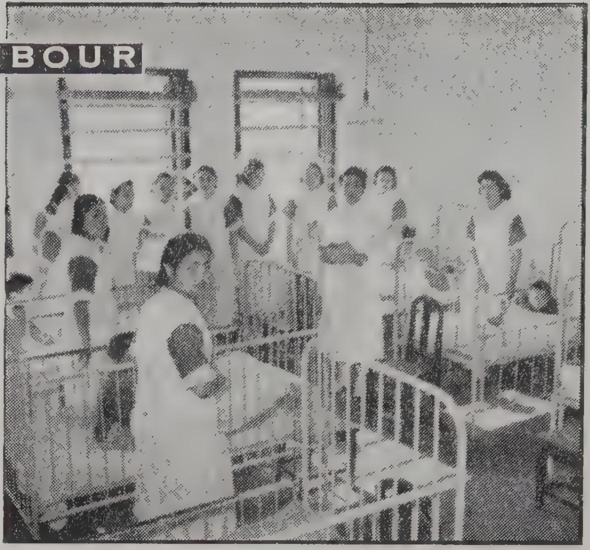
THE GOOD NEIGHBOUR

Help for Hospitals of China

THE current project of CORSO to provide specialised personnel to help in the reconstruction of China's hospital system is one which I am sure will meet with a ready response from the people of this Dominion, for it will only be evoking on a wider scale the practical interest and sympathy which one province in particular has shown towards medical work in Southern China. Situated 13 miles inland from the river city of Canton, the institution whose picturesque Chinese name, literally translated, means the "Hospital of Universal Love," is a direct link with the Otago district, dating back to the old gold-mining days. The incidence of Chinese among the miners was high, and though many did not live long enough to enjoy their hard-won wealth (the records indicate a large number of deaths at a comparatively early age, probably due to the privations attendant on gold-digging at that period), those who eventually returned to their homeland were so appreciative of the comfort and guidance they had received from the Rev. Alexander Don during his ministry among them that they requested the establishment of a mission in their own villages. The present pastor to the Chinese community in Dunedin was the man who undertook this important task, and not only were the bulk of his assistants drawn from Otago, but the "Hospital of Universal Love," founded a few years later by Dr. John Kirk, was under the auspices of the Presbyterian Church of Otago. Ever since its inception 40 years ago the hospital has rendered inestimable service, especially among the poor. Moreover, it has been responsible for the training of numbers of nurses and midwives, and the resident doctor, usually a New Zealander, has also assisted with the instruction of the students at the Medical College of Canton.

When Japan commenced hostilities bombs frequently fell wide of the railway target and hit the hospital instead, and after Pearl Harbour the New Zealand staff was interned, leaving their Chinese colleagues to carry on alone. This they did, despite bomb damage, the depredations of bandits, and a dwindling drug supply. When the Japanese took possession of the buildings they accepted the invitation of a nearby town to continue their ministrations in the "Hall of Ancestors," so the work of healing by modern methods went on while the ancient gods looked down benignly from the walls. At the end of the war the peasants painstakingly assembled the hospital equipment in wheelbarrows and trudged back with it to its original quarters, where up to 500 returning refugees were daily given food and medical treatment as had formerly been the case at one stage of the Japanese occupation. In having a building to come back to, also a New Zealand doctor to take charge—he had been waiting in Free China for this opportunity—the "Hospital of Universal Love" was more fortunate than a good many others which were wiped out of existence altogether.

The International Relief Committee set up by missionaries and influential Chinese at the outbreak of the war arranged for drugs and surgical supplies to be flown in from India, and the Friends' Ambulance Unit (a British organisation which included 13 New Zealanders) dealt with the difficult problem of distribution, utilising charcoal-burning trucks, mules, buffaloes, wheelbarrows, and even men's backs to deliver the precious drugs wherever there was a hospital functioning. Their resourcefulness was proverbial. For instance, they put the heating and water system of a bombed-out hospital into commission again by the ingenious use of 40-gallon oil drums and bamboo pipes, and they kept their trucks in running order by "cannibalising" one when necessary and using the spare parts to patch up the rest of the convoy. They risked death time and again when skirting enemy-occupied territory, and their contribution to Chinese morale was invaluable.



School of nursing, Shanghai, China.

Chengtu, 300 miles west of Chungking, the wartime capital, was a main depot for the medical supplies arriving via the "hump." It was also the centre for the West China University and Medical College, and various refugee universities, such as those from Tsinan (Shantung) and Nanking. The University campus covered three-quarters of a square mile, and the grey brick buildings with their semi-pagoda shaped roofs of green tiles were set off to advantage by the graceful ginkgo trees and different varieties of Chinese hardwoods. Some of the classrooms and dormitories were damaged by bombing; not a door or a window in the place would shut properly because of the blast, and an unexploded bomb buried itself in the ground outside the library and museum. Yet this did not prevent work from proceeding as usual, and an extensive building programme was embarked upon, even though all the equipment had to be made locally. The evacuation of the Peking Union Medical College brought to Chengtu the Peking Nursing Unit, which was noted for its exceptionally high standard of training, as most of the trainees were university graduates.

The demand for nurses is insatiable in China. There is only one doctor for every 90,000 people—a liberal estimate, this; the equivalent here would be 20 doctors for the whole of New Zealand. Vast rural areas are without any hospitals whatever, and dirt, disease, and superstition are rife. The old tradition which precludes the scholar from doing manual work is breaking down, but with inflation adding to the misery caused by 10 years of continuous warfare, and many students having to provide for and educate the younger members of their families, the forgoing of the better-paid occupations entails very real sacrifice as well as the highest ideals of service on the part of those who enter the nursing profession. Surely it is for us to do our utmost to support CORSO's campaign to send them the doctors; instructors to train nurses, laboratory assistants, and dispensing chemists; hospital technicians; medical administrators, and other experts they so urgently require that their desire to relieve the sufferings of their people may be realised. There are many ways in which we can help—by monetary gifts; by donations of clothing, linen for dressings, wool, sewing materials, toilet requisites, first-aid kits, fat for soap-making; by making hussifs, bandages, and peggy-square blankets.

The need is great. Whatever the nature of our contribution we count it a privilege to assist our gallant friend and ally, China.

Mary

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MAKING A WINTER SKIRT

By EVA TOPPING,
Rural Sociologist, Auckland.

A WARM skirt for wearing with a blouse and a cardigan or with hand-knitted woollies is a necessary item of the winter wardrobe, and it is not difficult to make a smart, well-fitting garment at home. Materials suitable for making skirts are much more plentiful now than they have been for some years, and there is more variety from which to choose.

IF it is the first attempt at making a skirt, take care in selecting the fabric; avoid easily-frayed material which will cause difficulty during fitting, and distinct patterns such as large overchecks or stripes which would have to be matched at seam lines. Small checks are "safe," as are tweeds of the Donegal and Harris type and worsteds without definite lines or patterns. If possible choose all-wool material, not only for warmth and good appearance, but also because woollen fabrics are easier to handle and press.

Style and Pattern

In the heavier materials, skirts cut on the straight will be found easier to make. Choose the style and buy the pattern in the correct size. To determine the size, take the waist measurement with the tape pulled fairly tight; then take another measurement at the line of the greatest width round the hips, usually between 6 and 7in. below the waistline, according to the height of the figure. Skirt patterns are often bought by waist measurement, but if the hip measurement is above average, it may be better to choose the pattern size most nearly corresponding with that; the waist can then be adjusted at the seams and with darts if necessary. A table on the back of the pattern envelope gives measurements and the amount of material in different widths required for the particular style. Be sure to buy the amount of material to correspond with the width.

Next visit the haberdashery counter for matching sewing cotton, a length of petersham belting for the waist, hooks and eyes, and dress fasteners for the placket. Slide fasteners are often obtainable now if this fastening is preferred, or there is once again the domed placket tape. Some binding for seams and hems may also be required. Most commercial patterns have a list of the finishings and the amounts needed printed on the outside.

Pre-shrinking the Material

If there is cause to suspect the material of a tendency to shrink unduly, it is wise to pre-shrink it before cutting it.

For woollen material take a small sheet and soak it in cold water. Lay the fabric flat on the wet sheet, turn in the edges of the sheet, and roll it up tightly. Wrap the roll in a bath towel, another sheet, or newspaper so that the moisture can penetrate the new material and lay it aside for 24 hours. Remove the material and press it on the wrong side with a warm iron until it is dry. Use a cloth between the iron and material to avoid "shine."

Laying out the Pattern

Study the diagrams in the pattern envelope for laying out the pieces on the material. Choose the one which suits the width of the cloth and mark it with a pencil or coloured crayon. Then spread the material out on a large table and set the pieces of pattern on it exactly as shown in the diagram. Many home dressmakers like to set out the pattern on the material on the floor; that is a little hard on the knees, but it has one big advantage: The entire pattern can be set out flat at once and a mistake can be seen immediately.

Check each piece carefully before pinning it on. Be sure that the pieces to be cut double are correctly placed, that the straight of the pattern is lying on the straight grain of the material (arrows or large perforations usually indicate the direction of the straight of the material), and that all the necessary pieces are set out. If the material has to be folded, have the fold exactly on a thread, especially if the material has a check or other design.

Smooth the pattern on to the fabric and pin it there, using plenty of pins so that it will not slip when the material is being cut. Pin from the top without putting the hand under the material. Where notches have been made in the pattern indicate them by cutting out little projections so that the seams will not fray at these points or mark them with coloured cottons after the cutting out is finished and before the pattern is removed. If wider seam allowances than those given on the pattern are required, or if the material frays easily, add ½ to 1in. extra on straight lines and ¼ to ¾in. on curved lines.

Cutting

Use large, sharp scissors and cut a clean, straight edge, sliding the scissors along so that the material is not lifted unduly. Putting one hand on the pattern and keeping the scissors constantly on the table is a help. Short snips make an untidy edge which will have to be evened later. Be sure the scissors follow the pattern line exactly; if they cut inside, the garment will be tighter or the seams uneven.

Marking the Pieces

The edges of the pattern pieces are marked with notches to show where they are to be joined, and if projections have been cut, these points will not need to be marked. Use a coloured thread and make a few stitches at each mark as a guide. Perforations or other marks which indicate such points as pleats should also be marked; that may be done in a similar way with thread by making "tailor's tacks." Take a double thread in the needle and make a double stitch with a long loop over each perforation; pass to the next perforation or mark and make another double loop, repeating until the pattern markings have been covered. Cut the thread and separate the pattern from the material; if the material is double, cut the marking threads between the material, leaving little tufts of thread in each half for guide marks (Fig. 1).

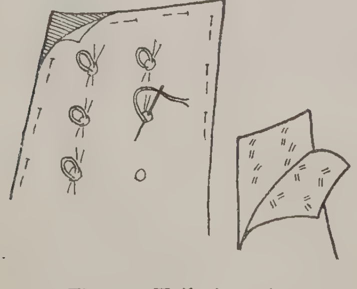


Fig. 1—Tailor's tacks.

Another method is to set pins in at each mark, gently lift off the pattern, and mark the corresponding place on the opposite portion with another pin. Chalk marks can be made over the pins as a precaution against "losing the place" if the pins drop out while the pieces are being basted (Fig. 2).

Trial Fitting

Pin together any seams in front and back portions. Set in the pleats temporarily by pinning them, and pin the side seams. Fit the skirt on to see whether alterations must be made at the seams. This is only a trial fitting to give an idea of the general size and to see whether pleats should be wider or narrower, whether every seam should be taken in slightly, or whether a good fit will result by altering at side seams and possibly by making darts at the back waistline.

Making Up

The first step in making up depends on the type of pattern being used. The checked skirt illustrated has three pieces in front and three in the back. In a similar pattern, whether gored or pleated, the seams in the front and back pieces are joined first. Single seams should be used and each one pressed out flat, using a hot iron and a well-damped pressing cloth. Set in

MAKING THE PLEATS

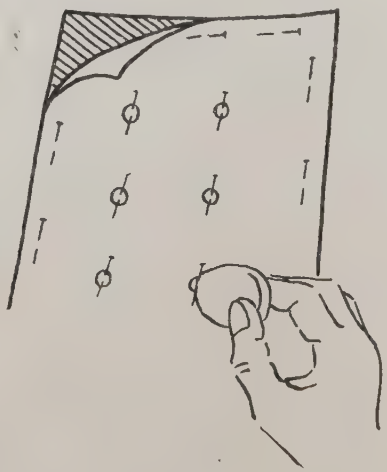


Fig. 2.

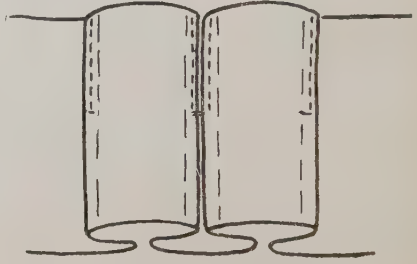


Fig. 4—Box pleats.

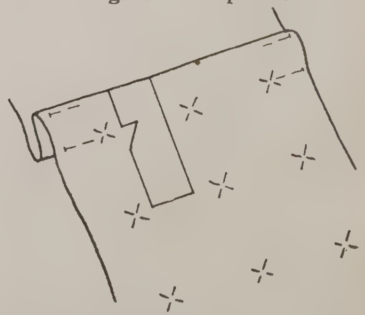


Fig. 5—Measuring and laying pleats.

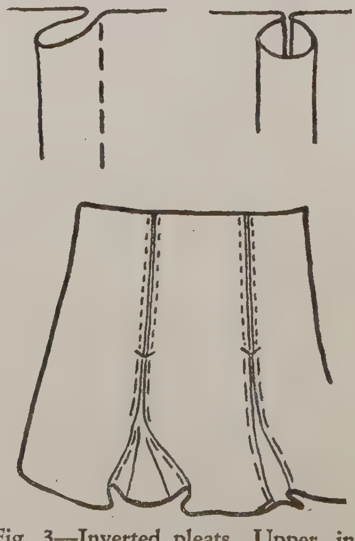


Fig. 3—Inverted pleats. Upper, inside; lower, outside.

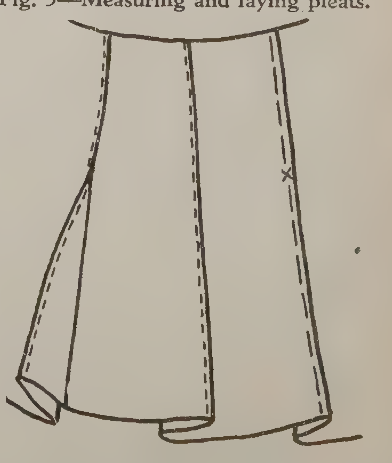
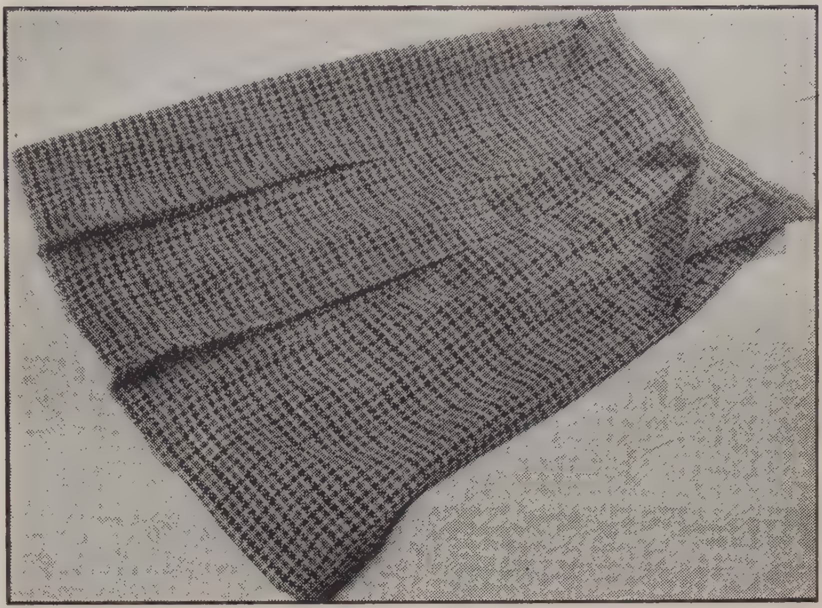


Fig. 6—Stitched pleats.

MAKING A WINTER SKIRT



Checked skirt showing set-on belt of self material and plain placket described below.

the pleats and tack them securely; take the stitches through all three thicknesses of material as far down as the stitching is to be, then through the fold of the pleat only to the hem. Press them in well and then stitch from the top close to the edge. Figs. 3 to 6 show the details of making pleats.

Fit a length of petersham belting round the waist, allowing turnings and making the belt tight, though not too tight for comfort. Sew on hooks and eyes, keeping the hooks to the edge of the belting and the eyes projecting a little. Whether this belt is used in the finished skirt or not it is well worth making, as it gives a firm, definite, fitting line at the waist. Pin the side seams of the skirt with the wrong sides together, then put on the belt and try on the skirt.

Pin the centre front and centre back of the skirt to the corresponding positions on the belt and adjust the side seams to fit. If the waist of the skirt is too wide at the back, try the effect of a dart on either side of centre. At the front the side seam alteration should take care of any surplus. Remove the skirt carefully and mark the position of seams, etc., with chalk or with tacking stitches taken through one thickness of material on each side of the row of pins at the seam. Take out the pins, reverse the material, and tack the skirt together on the marked line. Stitch it and press it open as before, leaving 7 to 8in. open at the top of the left side for the placket opening.

TYPES OF PLACKET

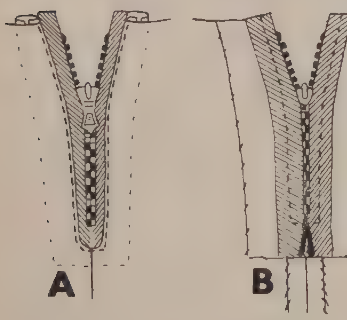


Fig. 7—Zip fastener placket. A right side. B wrong side.

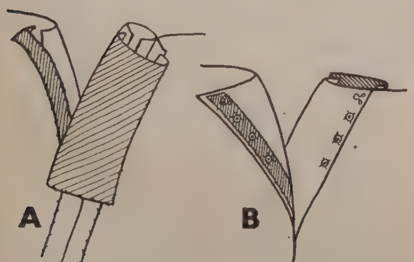


Fig. 8—Placket with fasteners. A inside, showing facings (left, front; right, back). B outside (left, front; right, back).

Finishing the Placket

Here are three ways of making the placket opening:—

Slide fastener.—Turn down the front and back sides on the continuation of the seam line, and press and tack them. Close the fastener and tack the skirt front and back over the tapes, keeping the folds close to the metal but leaving sufficient clearance for the slide to work easily. Stitch carefully, making a bar or point of stitching at the lower edge (Figs. 7A and 7B).

Plain placket with fasteners.—Turn the front on the seam edge, tack, and face with a strip of lining material cut on the cross. Catch a stitch on each edge by hand. Cut a piece of skirt material on the lengthwise threads 2 to 2½in. wide and the length of the placket. Lay it on the right side of the back seam and stitch it exactly on the extension of the seam line. Trim the edges and press flat. Turn a single hem and face back with lining (Figs. 8A and 8B). Sew on dress fasteners and a hook and eye at the waistline.

Domed tape.—Turn back the seam allowance of the front and tack down domed tape. Snip the seam at the end of the placket. Turn the seam allowance toward the front join on a piece of strong material (cotton or silk) or face back with catch stitches. Sew on the corresponding piece of domed tape. Make a buttonhole bar at the base of the placket to prevent strain on the seam in wear.

The Waistline

The waist can be finished by adding a band of self material. When the waist has been fitted and the placket made, set on the belt, extending the front over the back and finishing in a point (Fig. 9). When tacking gently stretch the belt and ease the skirt on to ensure a smooth fit.

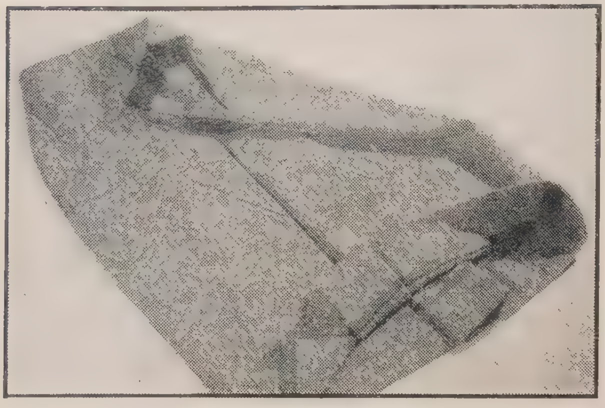
If the waist is to be set on to the petersham belt, turn the top edge and pin the belting inside, tack it very firmly, and stitch it close to top edge (Fig. 10). When no stitching on the outside is desired, turn the skirt over the top of the belting and stitch it flat. Sew a strip of bias binding over the raw edge on the inside of the belt (Fig. 11).

Turning the Hem

When the skirt has been fitted and joined, try it on again to determine the length required. Measure from the floor with a skirt marker or yard ruler and mark the turning edge with chalk or pins.

If you are making the skirt for yourself and have no helper available, here is a way to manage alone: Take a piece of chalk and stand by a table which is low enough to touch you below the hips. Hold the chalk steady on the table top and turn slowly round, marking the skirt as you turn. Alternatively, chalk the edge of the table with ordinary blackboard chalk, and as you turn the chalk will be

MAKING A WINTER SKIRT



Tweed skirt with zip fastener placket, petersham belt, and hem finish.

THE BELT

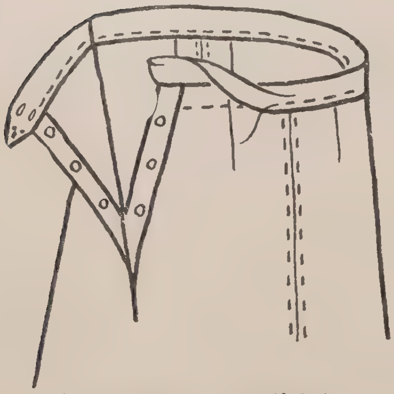


Fig. 9—Setting on self belt.

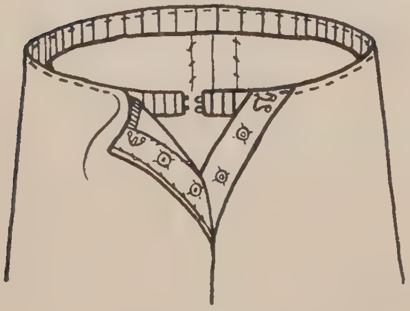


Fig. 10—Skirt set on petersham belt with outside stitching.

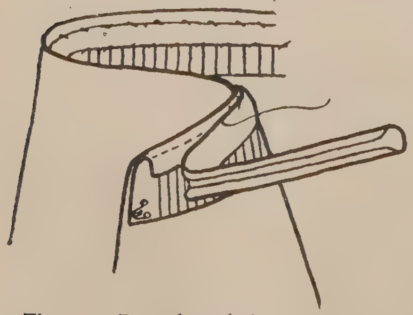


Fig. 11—Petersham belt and binding.

THE HEM

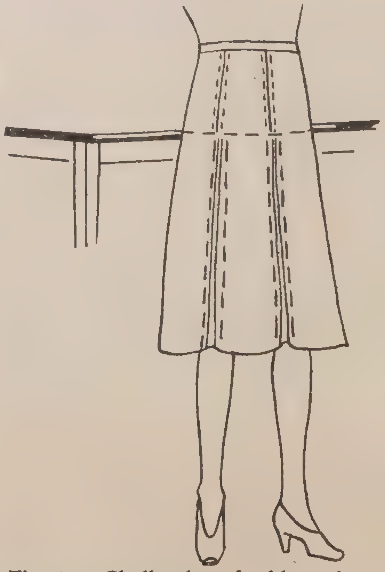


Fig. 12—Chalk edge of table and revolve slowly against chalk mark to transfer to skirt.

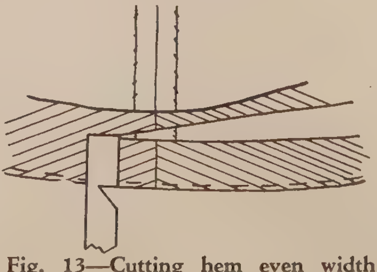


Fig. 13—Cutting hem even width with marker.

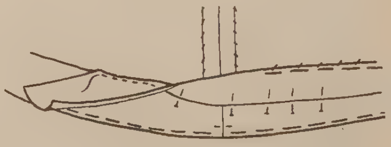


Fig. 14—Finishing hem with bias strip.

transferred to the skirt, but for that way only the sharp edge of the table must be marked or there will be too broad a line to be accurate (Fig. 12). For the front it is quite easy to put pins in a line, but the back is rather awkward and the chalk marking is easier to manage.

Take the skirt off, lay it flat on the table, and measure down from the marked line; keep the measurements uniform and the skirt should hang evenly. Set in a row of pins or tacking on the turning. Next measure the hem width all round, setting in pins or marking with chalk. Make the hem to the desired width or to correspond with the narrowest place, then trim it even (Fig. 13). Before turning the hem, stitch on the binding or turn once and stitch; binding makes a better job if the material is heavy. Tack the hem first on the turning line, smooth it down with the hands, pin it at various points, and tack it at the hem line (Fig. 14). Press before and after catch stitching the hem by hand.

Neaten all the seams by oversewing, press it again, and the new skirt is ready to wear. Seams can be oversewn with matching silk or with fine darning wool. Finishing with wool is quickly done and is most suitable for the heavier woollen tweeds. When the ground of the material is a neutral colour, natural-coloured darning wool is almost invisible.

[*Photographs by Sparrow Industrial Pictures Ltd.*

"A Place for Everything"

MY slogan is "A place for everything and everything in its place." When I was first married I had a workbox made with a tray, and my embroidery silks and cottons are wound on dozens of camera spools. The box stands on the floor, as it is too heavy to use on a table, but I have a large island basket with a lid—this is my "handy kit" and even my menfolk know where to get needles, etc.

My knitting bag is a bulky one fitted on to a pair of barbells complete with ball ends. In it I keep the work on hand, also a waxed taper tin for the steel sock needles and another needle holder for the larger needles. I made the holder from a piece of cretonne folded up like a large pocket bag with a flap. The pocket has a piece of white tape right across it at the top, and the pocket is machined into twelve or fourteen divisions. Each division takes one number in needles, with the last two divisions made wider to contain stitch holders. The needle sizes are marked in red ink on the white tape, and when the flap is turned down over the tops of the needles the holder can be rolled up and tied with a ribbon and nothing can drop out. I keep all my knitting and sewing books in a big sachet so that I have everything under cover and never lose anything.

—"E.G.", Auckland.

BRINGING THE SUN INDOORS

By NORMA K. METSON, *Rural Sociologist, Wellington.*

LIKE a recent article on lighting and heating, which appeared just when drastic power cuts were being imposed over the North Island, this discourse may seem a little ill timed. Who thinks—except with wistful longing—of living in the sun when icy winds are howling down the chimney and the ground is hard with frost? But surely it is in winter, when sunlight is rare, that additional warmth is most precious and a house planned with adequate windows and sheltered verandas and terraces is most appreciated. In summer the house may be needed rather as a shelter against the fierceness of the heat.

THE architectural development of New Zealand houses in their provision for outdoor living and sunny rooms has been very interesting. Most early houses had wide verandas on at least one and often on three sides. French doors opened out on to them, often from rooms which had no other windows. With the passage of time part if not all of those verandas were built in so that they formed auxiliary rooms, but they were not very satisfactory. Often the only means of access was by a door opening on to the veranda; sometimes existing windows were built over, making the room behind very dark; and, if the veranda was originally narrow, the resulting room was an awkward shape.

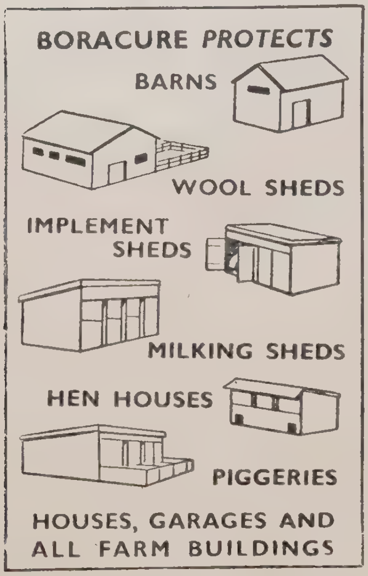
Later houses were built with no verandas in front but only a small porch, though the utilitarian back veranda holding firewood, fowlfeed, boots, and clothes lines developed as a feature of most farm houses. Then came the bungalow type, with a deep veranda under the main roof slope and high side walls which made the rooms behind very gloomy, though they had the advantage that with a gate across they made an admirable playing space for small children. Place windows above these side walls and the modern sunporch appears—a small room with windows on two or three sides, intended to catch the sun all day but sometimes through lack of thought built on the cold side of the house.

The most recent development is toward the "solar house," which has all lived-in rooms on the sunny side, with large windows, eaves wide enough to keep out the sun's rays in the height of summer but allowing full penetration in winter, and glass doors opening out from at least one room on to a stone or concrete terrace. The terrace is usually unroofed, but the eaves may be extended to cover a small area.

Furniture and Furnishings

The sunporch is frequently the most popular room in the house, partly because of the warmth and brightness with which the sun should flood it for the greater part of the day, and partly because of its informality. Delicate fabrics and subtle colour schemes have no place here; furniture and furnishings should be sturdy, washable, and gay. Crisp light cottons, gingham, seersucker, and muslin are suitable for curtains. No dye has yet been invented which is proof against fading under frequent direct sunlight, so be prepared to see colours vanishing in a relatively-short time. Sunlight also causes fabrics to "tender" or rot, and curtains should be made so that they can be turned upside down or changed from side to side, so that one area is not continuously exposed.

The sunporch in the heading illustration is used as a family living and dining space. Photograph by Sparrow Industrial Pictures Ltd.



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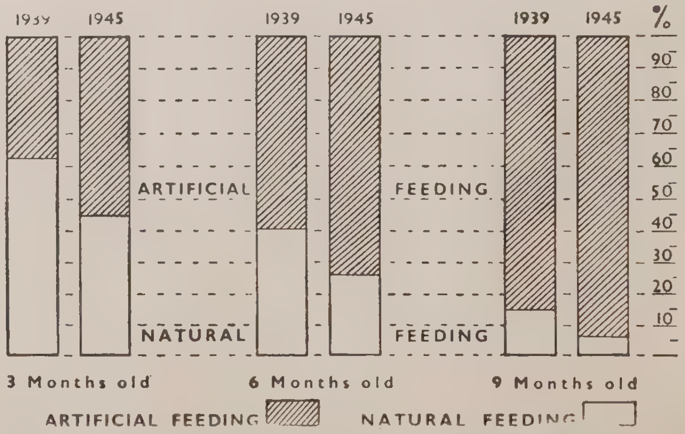

This graph illustrates the progressive decline in natural feeding in New Zealand. *Babes do best on the Breast.* Mothers — Doctors — Nurses — Will you do *your* best to see that our babies are *fully* breast-fed?

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The sunporch will be used primarily for whatever household activity most needs extra space, whether it be sleeping, meals, children's play, or work. It should never be permitted to become a dumping ground for old furniture or seldom-used articles. Some wall space planned for storage, preferably cupboards with sliding doors, will be found most useful. If one small section is made tall enough to hold clothes on coathangers, it will be convenient for hanging unfinished garments when sewing or as a wardrobe when the room is used for sleeping. The remainder of the storage space will inevitably be necessary for toys, games, books, sewing requisites, spare bedclothes, and perhaps some china and table linen if the room is used frequently for meals. In a rectangular room the whole of one end wall would not be too much to allow, but it may be necessary to use only a section of this or of a side wall to fit in with wardrobes or cupboards planned for other rooms. If wall cupboards cannot be built, drawers and cupboards may be planned under a built-in bed or window seat.

This veranda was wide enough to form a spacious room when glassed in.

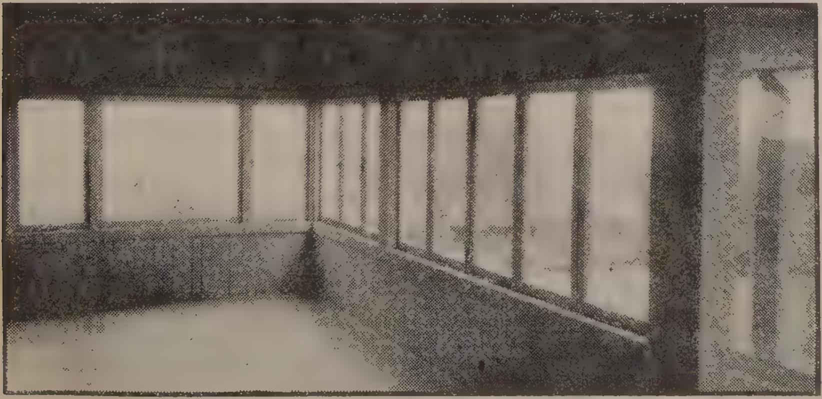
A sunporch can be made a minimum of 6ft. 6in. wide, which will allow a stretcher or divan bed placed crosswise to fit exactly. That is not sufficient for an ordinary bed, and an additional 12in. or 18in. will add greatly to convenience by allowing clearance at the foot or space for two beds along opposite walls. A folding or extending table and folding or easily-stacked chairs or stools will serve for meals or games and can be quickly removed if space is needed for other purposes.

Window walls facing north and west will give the warmest room and the afternoon sun, which is pleasant for sitting in after the main rush of the morning's work is over. An east-and-north aspect will give a room which is bright and cheerful from early morning to mid-afternoon, and is particularly suitable for sleeping or small children's play. To obtain the advantage of air as well as sun, all windows should open; the sliding type which can be pushed right back is ideal. If ventilation is inadequate, the room will become unbearably hot in summer.

Relationship to other rooms must also be considered in placing a sunporch. If it opens from a bedroom, its use will be more restricted than if it opens from a living room. A door opening on to a veranda or directly outside is an advantage if the room is adopted as the children's headquarters.

Benefits of a Terrace

One sunny room does not make a house, however, and the most admirable sunporch will not compensate for lack of sun in the other rooms of the house. Hence the development of the "solar house," with its large windows and open terrace. In a climate in which if the weather is fine enough to be outside, it is fine enough to be right outside (and this applies to many districts in New Zealand) the living terrace is an attractive feature. Sheltered from the prevailing winds by the angle of the house and by adequate planting of garden hedges, it is an ideal place for the baby's play pen, an outdoor meal, or tasks like pea-shelling and mending.



A back porch used for storage and as a passageway to basement, laundry, and washroom.

Do not be intimidated by the word "terrace." It may call forth visions of vast stone steps, masonry walls, and elaborately - trailing vines and rock plants. But every good farm home aspires to an area of concrete round the house entrances, and with a little extra care in planning that can easily become "the terrace."

A sloping site, offering the possibility of a sunny terrace facing the view and a storey and a-half house with bedrooms opening out on to flat sun decks, will be more difficult to plan than a level one, but gives admirable results and is worth consideration. In fact, two-storey houses, though they have never been very popular in New Zealand, offer advantages in planning for sun in as many rooms as possible. In a one-storey house, if an L-shaped plan is not desired, the necessary angle for the terrace suntrap could be achieved by attaching garage or storerooms to one end of the house.

With today's small houses provision for outdoor living whenever the weather is favourable relieves pressure on otherwise crowded rooms, and bringing the sun indoors makes a house much more cheerful and healthy to live in.

Winter Work in the Flower Garden

ORNAMENTAL trees from which branches have been cut off incorrectly are seen all too often in gardens. The correct method of trimming trees to ensure that the wounds heal properly is described in this article by J. P. Hudson, Horticulturist, Wellington, who also deals with other winter jobs in the flower garden.

[Green and Hahn Ltd. photo.

Deciduous trees have a special charm when seen in the winter sun.

MANY fungi readily attack the wood of trees if they can gain admittance, causing the disease or even the death of shoots, branches, limbs, or the whole tree. Spores of some fungi are present in enormous numbers in the air, especially in old neglected gardens or woodland where decaying wood abounds.

Fortunately the bark of trees is an excellent protection against most spores, but if for any reason the bark is deeply injured, any spores that alight on the injured place may be able to become established in the wood below.

As there is always a serious risk of some disease gaining entry through pruning wounds, it might be argued that all pruning is undesirable, but some pruning has to be done to remove dead, broken, inconvenient, or dangerous branches and to build up shapely trees with only one main trunk.

It takes a long time to produce a good tree. Incorrect pruning, which permits rots or diseases to become established in the main framework, may shorten the life of a tree by many years, and its amenity value in the future may be lost.

Yet the home gardener often thoughtlessly lops off a branch overhanging the garden or house and leaves a wound which it is quite beyond the power of the tree to heal.

Healing Tree Wounds

Between the bark and the wood of trees there is an important layer of cells known as the cambium layer. These cells are able to produce new tissue (callus) to cover over any injury which may occur; but callus can grow across only more or less flat or hollow surfaces, and cannot develop round sharp angles or cover over the end of a projecting stump.

Pruning cuts, therefore, should always be made flush with the barrel of an existing limb or trunk (Fig. 1 B), and stumps should never be left after pruning (Fig. 1 A). If a stump is left, a ring of callus will develop around its base (Fig. 1 A1), but cannot cover it until the growing trunk envelops the stump in the course of many years of growth. It is likely, however, that the stump will have rotted long before then, leaving a wet hole in the side of the tree from which decay can spread down through the centre of the trunk. Cuts made level with the barrel, however, normally heal over completely (Fig. 1 B1).

To assist healing and to ensure that the exposed wood remains healthy until it has callused over, all cuts should be treated with some antiseptic dressing as soon as they have been made. Many materials have been suggested and tried for this work, including white lead paint, coal tar, Stockholm tar, and creosote. Experiments carried out in New Zealand by the Plant Diseases Division, Department of Scientific and Industrial Research, have shown that bituminous paint is as cheap and efficient a wound covering as any.

Bulletin No. 161, "Control of Orchard Diseases and Pests by Spraying," obtainable free from any office of the Department of Agriculture, describes methods of disinfecting tree wounds before dressing with bituminous paint.

Efficient tree pruning depends on having the proper tools kept in good order. It is most important that saws should be properly sharpened and have enough set to clear the cut in sappy wood.

Method of Removing Branches

Branches should always be cut off in the following way to ensure that the wound is likely to heal (see Fig. 2):—

1. Make a saw cut part way through underneath the branch, two feet or more out from the main trunk. This undercut ensures that a strip of bark is not torn off from the trunk when the branch breaks off. On trees where the bark is liable to tear easily a strip of bark may be cut completely out from the lower half of the branch.
2. Cut the branch from above, working slightly on the tree side of the undercut. In pruning heavy branches it may be necessary to sling them up from above so that they can be lowered gradually. Careful judgment is needed and heavy branches are best removed under supervision of men experienced in the work.
3. Cut off the stump as close to the main trunk as possible. Unfortunately, this means a long cut through the base, where the branch is buttressed into the trunk, but the time

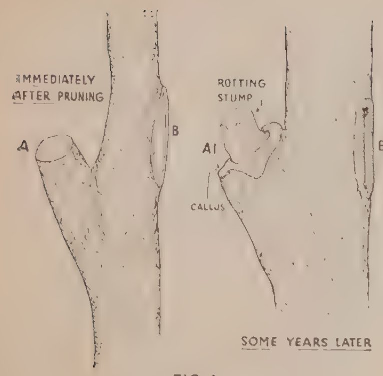


FIG. 1.

A badly-pruned branch on which a stump has been left. The wound at A will not heal over properly (A1), but the stump will rot and may permit decay to enter the trunk of the tree. Branches trimmed off flush with the main barrel as at B will usually heal completely over in course of time (B1).

and trouble are negligible compared with the shortening of the life of the tree that can result from incompetent pruning.

4. Trim the margins of the saw cut with a knife, and dress the wound with bituminous paint.

Time for Pruning

Most trees can have branches removed quite safely at any time of the year, but some species "bleed" badly if they are cut between late winter, when the sap begins to rise, and early summer, when the leaves are fully developed. Walnuts, especially, are liable to bleed if pruned in spring, as also are birches and some maples. Trees will not usually "bleed to death," even when pruned at the wrong time of the year (although glasshouse vines will do so), but serious bleeding has a very weakening effect on a tree.

These principles are so well-known to foresters and many gardeners that it is interesting to recall that the system of cutting off branches flush with the main trunk is quite "modern" by horticultural standards. Before the latter part of the nineteenth century it was normal to cut off branches a foot or more from the main trunk and leave the stump to decay, and it was not until about 1890 that this practice was seen to be wrong.

One of the best books for the home gardener on the subject of pruning is "The Pruning of Trees and Shrubs," by W. Dallimore (published by Dulau, Oxford, in 1926, and republished in 1945, price 11s. 9d. in New Zealand). As a young student gardener Mr. Dallimore was connected with some of the original work done on this subject at Kew, following the theories of two French scientists who had studied the botanical aspects of tree pruning.

Garden Work for July

Bulbs growing in pots in the house should be watered sparingly until the flower buds appear. They should then be given ample water, although not enough to water-log the fibre if they have been grown in a bowl with no hole in the bottom through which surplus water can drain away. The effect of giving little water until the flower buds can be seen is to keep the leaves shorter than the flower stalk, thus ensuring that the flowers are held well clear of the foliage. Over-watering before the flower buds appear usually results in long, straggling leaves which spoil the appearance of the pots.

Chrysanthemums of the Japanese show varieties need a very long growing period. Cuttings should be taken as early as possible, but most varieties need not be propagated until August or September.

Glasshouse plants: Seeds of tuberous begonias, cyclamen, gloxinias, and *streptocarpus* should be sown in July in the greenhouse to provide plants for flowering later in the season. Nearly fill pots or boxes with a suitable soil mixture (John Innes seed sowing compost is ideal), level the top, but without pressing it hard, water lightly with a rose, and then sow the seeds thinly on the surface, but do not cover the seed with soil. Then place a sheet of glass over each receptacle to prevent the soil from drying out, and cover with brown paper to keep the light out. Look at the pots or boxes every day, and remove both paper and glass as soon as the seedlings can be seen. Seedlings can be ruined in a few days if the paper is left on too long, as they grow weak and "leggy" in the dark and are then ready to succumb to any disease which may attack them.

"Heeling in": Planting of shrubs, herbaceous plants, etc., can continue, provided the soil is not too wet—that is, it does not cake on the boots if walked on. If plants arrive from the nursery when conditions are not suitable for planting, they should be "heeled in" to await better conditions. To do this open up a trench in the soil, undo the plants if they have arrived in bundles, but do not remove the sacking from plants whose roots are wrapped individually, and line the plants out in the trench so that they are at about the same depth in soil as they were in the nursery, as shown by the soil mark on their stems. Fill the trench so that each root is in contact with the soil and tread gently but without caking the soil. If plants are heeled in in bundles, the roots in the centre of the bundles may not be in contact with soil and may dry out, or even die.

Iris of the fibrous-rooted, "clematis-flowered," Japanese types (*Iris laevigata*) are best divided up and transplanted in July. An acid soil, rich in humus, seems to suit them best, provided it is constantly moist through the summer months, though it need not necessarily be water-logged and boggy.

Layering of rhododendrons and magnolias can be done at almost any time of the year. The selected branch should be pegged firmly into a trench in such a way that the stem makes a sharp elbow in the soil. It is at this point that the roots will be formed and the sharper the angle the more likely the shoot is to develop roots. The stem may be twisted to break the bark at the elbow, or a tongue cut not quite half-way through and kept open by packing soil between tongue and branch. These treatments usually encourage more rapid rooting. It is better to bury the layered branch in the soil than in a mound built up above the surface, as a mound of earth dries out too easily and roots will develop only if the soil is constantly moist.

Lawns with a hard, caked surface benefit from being aerated in the winter. The easiest way to do this in the home garden is to dig a garden fork as far as it will go vertically into the lawn every few inches over the surface, withdrawing it without lever-

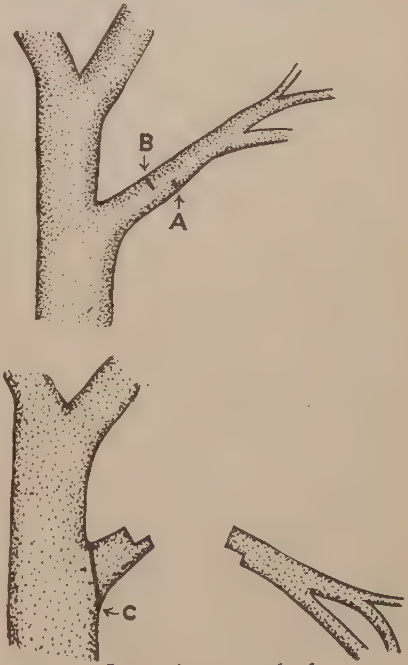


Fig. 2—Stages in removal of a tree limb. A first cut, B second cut, C third cut.

ing sideways and so tearing the turf. Aeration not only improves the physical condition of the soil, but encourages the grass to grow much better. After aeration lawns should be topdressed with a sprinkling of compost or good garden soil passed through a ½in. riddle to remove stones and lumps. The topdressing may look unsightly at first, but rapidly works into the lawn.

Pot plants in the house grow much more slowly in the winter than in the summer. They take up far less water from the soil than in the summer and there is also less natural drying of the soil in pots. Watering should be done carefully during the winter months, as too much water does more harm than good. **Far more plants are killed by over-watering than by lack of it.** There are various ways of finding out whether a pot needs watering, but the best is to tap the pot with a bone knife handle. Experience soon teaches the difference between the hollow, ringing note produced by a pot in need of water and the dull, thudding sound where the soil is already moist and the pot does not need watering. Turning pot plants round through 180 degrees every few days helps to keep them shapely. Unless that is done, they will grow one-sided, as the new growth will turn and grow toward the light. Frequent turning is especially important when pot plants are growing in the windows of houses.

Pruning: Shrubs which flower on the current season's shoots should usually be pruned in winter by cutting all the branches which grew the previous year back to within a few inches of the older wood. Hard pruning in winter encourages ample new shoots to grow and flower the following summer and also prevents the bushes from becoming too large and straggly. Among the shrubs which should be pruned hard now are *Ceanothus* spp. (Gloire de Versailles types), *Spiraea japonica* var. "Anthony Waterer," *Clematis Jackmanii*, *Buddleja Davidii* (*Buddleia variabilis*), and the dogwoods and other shrubs grown for the colour of their ornamental barks.

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Retaining walls are often a necessary feature of gardens on sloping sections. Earth-filled walls can be made beautiful by clothing them with a variety of suitable plants, and if properly built, these walls can be safe and permanent, even though no concrete is used in their construction (Figs. 3 and 4). They should be built as follows:—

1. Use the largest stones for the foundation and smaller ones for the upper layers, but reserve large flat stones for capping the wall.

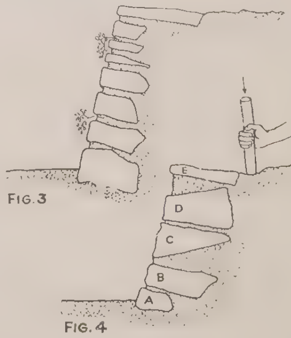

Fig. 3—Correctly-built wall planted as it was built.

Fig. 4—Several mistakes are shown in this wall. The largest stones should be at the bottom. Small stones (A) make poor foundations. Stone C, resting on a face slanting outward, will tend to slide downward and outward when the soil is very wet. The soil between D and E will also tend to squeeze out of the wall, as the upper face of D slopes outward, leaving E and stones above it ill supported.

2. Slant the face of the wall 15 degrees back from the vertical.
3. **Ram the soil tightly under, behind, and to each side of each stone as the wall is built. This is the secret of building earth-filled walls which will last well.**
4. Never place a stone so that its upper or lower surface slopes outward from the wall. The main reason why badly-built walls bulge outward in time is that badly-placed stones slip out when the soil is wet.
5. Plant the wall plants in between the stones as the wall is built to avoid the need for disturbing the soil afterward.

Among the plants which will clothe a wall and make it an attractive feature of the garden are *Campanula muralis* and other species of campanulas (blue and white flowers), *Lithospermum prostratum* (gentian blue), *Convolvulus mauretanicus* (too vigorous for small walls), purple, mauve, and blue varieties of aubretia, rock roses in many colours, *Phlox subulata* (mauve and other colours in named varieties), and alpine veronicas (hebes).

Seeds which should be sown under glass now to produce early plants for bedding out in milder districts include antirrhinums, verbenas, and lobelias, but most bedding plants should not be sown until later. There is no advantage in having bedding plants ready too early, as they soon become starved if left too long in the boxes, and starved plants never give satisfactory displays of flowers after being planted out.

Sterilised soil gives far better results than unsterilised soil for raising seedlings in boxes and for potting plants, provided it is properly mixed with other ingredients. Winter is a good time to sterilise a quantity of soil, the easiest way being to use the washhouse boiler as described in a leaflet entitled "Vegetable Production in the Home Garden" issued by the Department of Agriculture. This leaflet is obtainable free from any office of the Department. Sterilised soil should then be kept in boxes or sacks until required in the spring. The whole question of preparing soil mixtures for seed sowing and potting will be dealt with in a later issue of the "Journal" in time for preparations to be made for spring work.

Sweet pea seedlings growing in pots or boxes in a frame or glasshouse should now be hardened off and gradually given more fresh air and less protection. In mild districts they may be planted out when hardened off and placed up to 15in. apart if they are to be grown on individual canes for exhibition or about 4in. apart if they are required for a massed decorative effect.

Winter jasmine (*Jasminum nudiflorum*) lasts well in water, and is valuable for use in winter, when there are relatively few flowers for cutting. If cut when the buds are just beginning to burst, the flowers will open perfectly indoors and last well. As soon as the winter jasmine finishes flowering it should be pruned hard, all but one or two of the shoots being cut back to within an inch or two of their bases. In larger gardens where there is plenty of room for the bushes to develop the main branches may be left and all the side branches cut back. Hard pruning ensures that plenty of long, strong new shoots will grow to flower the following winter. Although the name "nudiflorum" implies that the flowers are produced on naked branches, this shrub behaves as an evergreen in the milder districts and does not usually drop its leaves in winter. This is a pity, as the flowers look more attractive on leafless shoots.

Reminders About Common Troubles

Peach leaf curl is a disease caused by a fungus (*Taphrina deformans*) which commonly attacks ornamental and fruiting peaches, almonds, nectarines, and apricots, especially in wet seasons, when varieties which are particularly liable to attack may lose most of their leaves. The earlier leaves become thickened, distorted, and deep red in colour. Later these leaves wither and die, but the leaves produced subsequently are generally healthy, although in some varieties, and in wet years, leaves may be attacked throughout the season. The health of the tree suffers unless the disease is brought under control, and in time affected trees may even be killed if the attack goes unchecked year after year.

Fortunately, leaf curl is one of the easier diseases to control. Trees should be sprayed thoroughly in early spring, when the buds are swelling, but before they burst, with lime sulphur (2 pints of lime sulphur in 4 gallons of water), or Burgundy mixture (6½oz. of bluestone, 6½oz. of washing soda, and 4 gallons of water, made up by dissolving each constituent in a portion of the water and then mixing the two solutions just before use). Burgundy mixture is suggested in place of the more usual Bordeaux mixture because of the difficulty home gardeners often experience in obtaining small quantities of fresh hydrated lime suitable for mixing the spray.

Bordeaux mixture is probably more efficient than Burgundy, however, and its use is preferable if suitable hydrated lime is available. To prepare 4 gallons of Bordeaux mixture dissolve 6½oz. of bluestone in warm water in a glass or wooden vessel, mix 5oz. of hydrated lime with water, strain through a cloth, add the bluestone solution, and make up to 4 gallons with water.

If experience has shown that one application of spray when leaf buds are seen to be swelling does not give complete control, the spray may be repeated 7 to 10 days later; but one thorough application of spray at bud movement will usually be sufficient to control this disease.

Spotted wilt of Iceland poppies is sometimes so serious in commercial gardens that whole beds have to be ploughed in. The disease, caused by a virus, is spread from plant to plant mainly by thrips, but may also be spread to some extent by handling healthy plants after touching diseased ones. Plants once attacked are worthless, never recover, and are best destroyed as soon as they are seen so that the risk of the disease spreading further is reduced.

From July onward Iceland poppy plants should be scrutinised regularly. Affected plants should be carefully lifted with a trowel, put into a bucket with the soil in which they were growing, and taken away to be burnt or deeply buried.

Because of the importance of this disease both to commercial and home gardeners, the following description of the symptoms of the disease is extracted in full from "Textbook of Plant Virus Diseases," by K. Smith:—

> "The first symptom is a clearing of the veins of the youngest leaves. These leaves become somewhat twisted, cease growth with the appearance of symptoms, and gradually turn yellow. The whole centre of the plant acquires a pallid, stunted appearance. In affected field plants, where the rosette of leaves is usually more vigorously developed than in pot plants, a bunched habit is acquired because of the stunting and yellowing of many central leaves. Frequently purplish blotches appear on some of the yellowed leaves or on their midribs or petioles, and a necrosis (dying of the tissue) may set in and destroy the petiole while leaving the leaf blade unaffected. Although diseased plants usually remain alive for weeks in a stunted condition, a rapid extension of the necrosis seen on the petioles sometimes causes the sudden death of the plant. The flowering stems of affected poppies are frequently much twisted and bent over; when they do grow erect they are shorter than normal, more sappy, and brittle, and the buds frequently open badly. The opening of the buds may be delayed until after erection from the recurved position, so that the tip of the bud points vertically upwards, a condition not seen in healthy poppies. The sepals, instead of lifting normally from the receptacle, often confine the petals so long that they burst out laterally. On the flowering stems of many affected plants water-soaked areas may appear from which a drop of milky-white latex exudes. This soon becomes brown on contact with the air and dries to a small hard pellet. The exuding of a brownish drop of liquid from necrotic patches on the leaf petioles or midribs in their early stages also occurs at times."

WINTER DECORATION

Bottle caps enamelled in bright colours (red is particularly attractive) make pretty substitutes for flowers. Remove the cork lining, punch two small holes in the centre of the cap, thread a length of fine wire through the holes, and twist into a stem. Placed in soil or sand in bunchy cuttings of geranium or other greenery, these "everlastings" make effective decoration when flowers are scarce.

—"Autumn," Canterbury.

Varieties of bread rolls.

CHELSEA BUNS

FANCY BREAD AND BUNS MADE WITH COMPRESSED YEAST

By EVA TOPPING,
Rural Sociologist, Auckland.

ROLLS, tea-cakes, currant loaves, and a variety of buns are made in much the same way as bread, using yeast as the raising agent. Usually a greater proportion of yeast to flour is used and so the process is quicker than making bread. Doughs for rolls and fancy breads are richer and sweeter than plain bread, as milk, fat, sugar, and eggs are used to give a shorter and more tender texture. The addition of fruit, flavourings, and spices makes for variety.

Bread Rolls

BREAD rolls are useful for the school lunches, as they save time taken in cutting bread and children enjoy a filled roll as a change from sandwiches. Stale rolls can be split and toasted or dipped in milk and rebaked for a few minutes. Split and baked until crisp in a slow oven they make appetising rusks which will keep well if stored in an airtight tin or jar and are excellent served with soup. The quantities given in the recipe will make 16 rolls.

The ingredients are:

1lb. of flour (white or a mixture of white and wholemeal)
2 teaspoons of salt
½oz. of compressed yeast
2 teaspoons of sugar
½ pint of tepid milk (a little more if using much wholemeal)

Put the flour, salt, and one teaspoon of sugar into a warmed basin and leave it in a warm place. Cream the yeast with the remaining sugar and add the milk, scalded and cooled to tepid. Make a well in the centre of the flour and add the liquid gradually, stirring by hand. Mix it to a dough, then knead well for 10 minutes or until it is smooth. Cover it and stand it aside in a warm place until it has risen to twice the original size. Turn the dough out on to a floured board and knead it lightly. Cut it into 16 equal portions and shape them into rolls. Place them on a warm, but not hot, greased or floured oven tray and set them aside to rise again to double their size. Bake them in a hot oven for about 15 minutes.

Shaping the Rolls

Make the usual finger or bun-shaped rolls or try some of these fancy shapes:—

TEA RING

FANCY PLAIT

Cottage Loaf: Divide the piece of dough into two portions, one twice the size of the other. Form each piece into a ball and set the smaller on top. Dip the little finger into flour and push it right through the centre of both balls, leaving a deep depression.

Crescents: Roll the dough out to ¼in. thick and cut it into wedge-shaped pieces. Spread them thinly with softened butter, roll them up from the wide end, and bend them into crescent shapes.

Knots: Shape the pieces of dough into rolls 6in. to 7in. long and about ¼in. thick, and tie each in a single knot.

Twists: Shape them into rolls as for knots, then cut each through the centre to within ½in. at one end; take the two loose ends and twist them round each other, closing them at the open end.

Plaits: Shape the dough in the same way as for twists, then make two cuts, plait these pieces, fold them together at the open end, and pinch them to make a point at each end of the roll.

Ovals: Shape each portion with tapered ends and make two short deep cuts on top.

Fantails: Roll the dough out very thinly into a rectangle. Spread it with softened butter or brush with melted butter and cut it into strips 1in. wide. Pile five or six strips together, cut the pile in pieces about 1½in. long, and place them on end on the prepared oven tray.

Shamrocks: Divide each small piece of dough again into three and shape each into a ball. Press them together in a small round tin.

When the rolls are hot from the oven brush them over at once with milk or beaten egg and milk mixture to give them a glossy top crust.

Rich Yeast Dough

Currant loaves and fancy tea-cakes are made from a richer dough. The quantities in the recipe will make one each of the three variations, bun loaf, tea ring, and plait.

The ingredients are:—

1lb. of flour
¾oz. of compressed yeast
About ½ pint of tepid milk
2oz. of butter
2oz. of lard or mild, clarified dripping
1oz. of sugar
1 egg
½ teaspoon of salt

Cream the yeast with one teaspoonful of sugar, add half the milk (scalded and cooled), sprinkle it with a little flour, and set it in a warm place for about five minutes. Cream the fat and sugar until they are light, beat in the egg, and add some flour to make a smooth cream. Add the yeast mixture and the remaining flour and salt and mix to a very soft dough with the milk. Beat it well until the dough leaves the sides of the basin, cover it with a cloth, and put it in a warm place until the dough has doubled in size, which will take about an hour.

Turn the dough on to a floured board and knead only sufficient to mould into the required shapes.

Small bun loaf: To one-third of the dough add 2 to 3oz. of currants or sultanas by folding them in as the loaf is shaped. Place it in a greased tin (6in. cake tin or 1lb. bread tin) and set it aside to double the size. Bake in a hot oven for half an hour.

Tea ring: Roll another third of the dough into a thin rectangle. Spread it with softened butter and sprinkle it with brown sugar and sultanas, raisins, or currants. Roll it up like a long Swiss roll, join the ends into a ring, and place it on a greased baking sheet. Dip a pair of scissors into flour and cut the ring almost through at intervals from the outer edge toward the centre. Turn each piece on its side, making them point in the same direction, set it aside to double in bulk, then bake it in a hot oven on a wire tray. Make a thin icing with three tablespoons of icing sugar and a little hot water, flavoured with lemon or vanilla essence, and pour it over the ring. The icing should be thin enough to run into the cracks and folds and should not be smoothed on to the ring.

Fancy plait: Shape the remaining third of the dough into a roll, working in two tablespoons of fruit, a pinch of ground spice, and one dessertspoon of mixed peel. Cut three ends in the roll and plait them, joining them again at the cut ends. Let the dough double in size again and bake it in a hot oven for 15 minutes. Brush the plait over with milk and sprinkle it with sugar while it is still hot from the oven.

Sally Lunns can be made from this rich dough. Use half the quantities, form the dough into three portions, and bake them in round, greased tins. Spread them with thin white icing and sprinkle them thickly with desiccated coconut.

Chelsea and Cinnamon Buns

Chelsea buns or cinnamon buns are just the thing to give the milkers for afternoon tea. Sent warm from the oven the buns will probably be very acceptable unbuttered; if they are cold, they can be spread with jam or jelly to save the butter ration.

Chelsea buns: The ingredients are—

¾lb. of flour
2oz. fat (butter, lard, dripping, or a mixture)
2oz. of sugar
2 eggs
2 tablespoons of fruit
A little mixed spice
A pinch of salt
½oz. of yeast
¼ pint of milk (scalded and cooled to tepid)

Put the flour into a warm basin, rub in half of the fat, and add the salt and half the sugar. Cream the yeast with one teaspoon of the remaining sugar and add the milk and beaten eggs. Pour the mixture into a well in the flour, and mix and knead the dough thoroughly. Stand it in a warm place until it has doubled in size. Turn it on to a floured board, shape it lightly, and roll it out to a square. Spread it with the other half of the fat and sprinkle it with the rest of the sugar, the fruit, and the spice. Roll it up like a Swiss roll and cut it into 12 to 16 slices. Stand them ½in. apart on end in a well-greased square tin. Set the tin aside to rise until the pieces are twice the size and bake them in a hot oven for 20 minutes.

Cinnamon buns: Omit the fruit, sprinkle the rolled, buttered dough liberally with cinnamon and brown sugar, roll it up, set it to rise, then bake it in the same way as for Chelsea buns.

Orange buns are another variation. Roll the dough as before, brush it with 1½oz. of melted butter, 1½oz. of sugar, and the grated rind of an orange. Roll it up and cut it into thinner slices than for the Chelsea buns. Allow the pieces to rise, then bake them for 10 to 15 minutes.

Photographs by Sparrow Industrial Pictures Ltd.

JASMINE

JASMINE (meaning happiness), starry-eyed, fragrant, delicately nestling among its pretty leaves—is anything lovelier? I loved it as a child when it draped itself all over our summerhouse. Many an hour I've wasted fossicking among the leaves trying to find one little piece of blossom hidden somewhere underneath, though I knew the season was over weeks before. What joy when I found one.

Then in my courting days I discovered a delightful bush overhanging the front door of our "wee house-to-be." It had huge flowers, sweeter-smelling and more prolific than any I'd seen. As we sat and talked over future plans the scent drifted on to the porch and added to the romance of the occasion. Sprays of jasmine were among the lilies and fern in my wedding bouquet, and when I entered my new home the jasmine tree stretched out its branches to greet me.

But in recent years my precious tree became too possessive and had to be cut down, much to my sorrow. Roots were chopped and pulled out, branches were flung in all directions. The gaping hole was filled up and meek little annuals were planted therein. Would my happiness desert me? No. By the time my next wedding anniversary came round there was a little branch of jasmine squeezing its way through a crack in the porch, its leaves waving defiance to all and sundry. My lovely jasmine had come back to stay.

—"Ann Margaret," Christchurch.

BEAUTY COMES FROM A SOUND DIET

ATTRACTIVE girls and women with good teeth, bright eyes, clear skin, shining hair, and unbounded vitality know that the secret of their outer beauty is that their attractiveness comes from within, writes an officer of the Department of Health.

[Photo News Ltd.

WITHOUT the right conditions under the skin, a girl cannot show much genuine attractiveness on the outside. Applying cold cream to a healthy skin may be effective, but on a bad skin all the cold creams and lotions on the market will not have any lasting effect.

The remedy for a poor skin, dull hair, and lack of vitality is to treat them from the inside. It must be remembered that it has taken years of wrong feeding and neglect to get yourself into an unattractive condition, so overnight miracles must not be expected when a start is made to clean up the trouble from within.

Importance of Diet

First of all, make a point of drinking a pint of milk a day. If you are scared of too much fat, skim off the top cream. The milk will make a difference to your teeth, and helps to give you energy.

Secondly, take some raw fruit or vegetable every day; citrus fruits, when available. are beneficial and tomatoes are packed with goodness. Make a salad of grated beetroot and carrot with lettuce and raw cabbage or silver beet and make it part of the daily diet. You will not notice any immediate improvement but over a period of six months you will find yourself **wearing** clothes instead of being merely a clothes prop.

Many people wrongly believe that such eating is expensive; actually it does not cost as much as the sum spent by many girls on cosmetics. Of course, a salad meal should not be eaten in addition to ordinary meals, but should take the place of one meal a day, say breakfast or lunch.

The best clothes, the most clever makeup, the latest hair style, and the most delicate eye shadow cannot possibly make up for dull listlessness and a tired face with a poor skin, as no-one can really hide those conditions.

Value of Wholemeal Bread

Another important point is the value of wholemeal bread. Eat at least half wholemeal. Grain refined to make white bread has lost most of the value needed to give you liveliness and sparkle.

If you do not want your neck disfigured with a goitre, make sure you use only iodised salt, as it makes up for the deficiency of natural iodine in New Zealand soils and therefore in our vegetables, meat, and other foodstuffs.

Many girls think that a "diet" is tiresome, but eating the foods that will do most good is not dieting at all; it is simply eating sensibly. Give it a trial for six months and you will not be willing to forsake the idea, for its benefit will be so apparent. Take milk, wholemeal bread (not just brown), citrus fruits, tomatoes, and fresh vegetables for salads, and develop the determination to maintain the diet. The value of it will soon be obvious.

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